July 1960
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CQ

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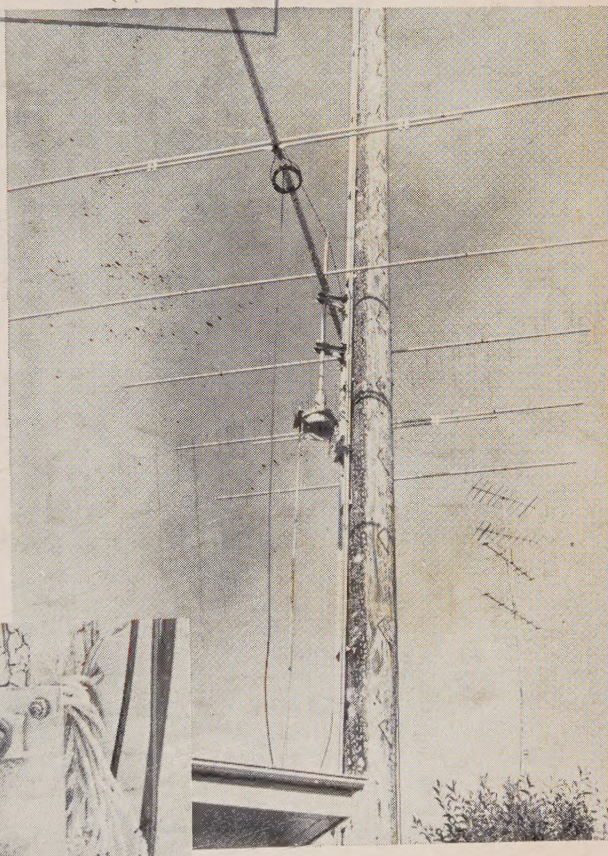
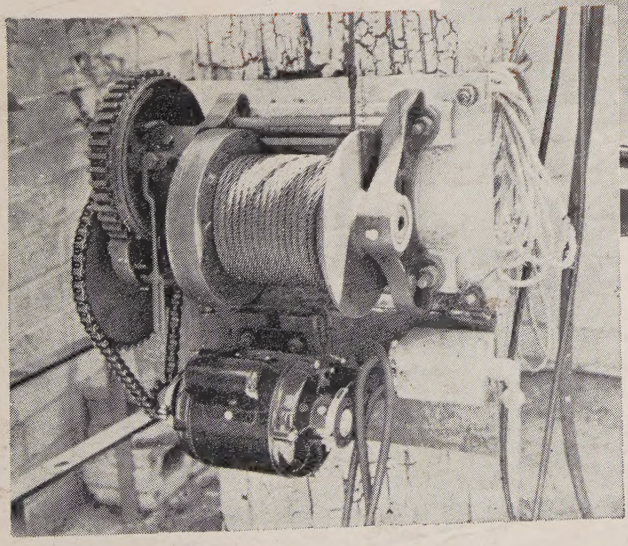
SPECIAL ANTENNA ISSUE





The Radio Amateur's Journal

COLLINS 30S-1 *for the loudest, clearest signal on the air*

the 30S-1 linear amplifier *features*

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- AUTOMATIC LOAD CONTROL ASSURES STEADY SIGNAL.
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You can have that steady, strong and clean signal — the mark of the accomplished ham — by adding Collins 30S-1 to your station. Visit your Collins Distributor. Find out how easy it is to own the finest of linear amplifiers — Collins 30S-1 — the linear amplifier for the advanced ham.

COLLINS

For further information, check number 1, on page 126.

Peace of Mind

Nothing can quite compare with the serenity and peace of mind that is yours when you KNOW your signals are going out clear and strong and *right on the kilocycle.*

Whether you're an old-timer or a novice, whether you have a kw outfit or a low-powered citizens' band transceiver, you'll get longer distance, clearer reception, less drift, with PR Crystals. PR's are the sure road to T9X.

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ALL PR CRYSTALS ARE UNCONDITIONALLY GUARANTEED. ORDER FROM YOUR JOBBER.

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FCC assigned frequencies in megacycles: 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225; calibrated to .005%. (Be sure to specify manufacturer of equipment) **$2.95** Net

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Official assigned frequencies in the range. Calibrated to .005%. 1600 to 10000 Kc..... **$3.45** Net

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To determine band-edge. To keep the VFO and receiver properly calibrated. 100 Kc..... **$6.95** Net

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40 and 80 Meters, PR Type Z-2

Rugged. Low drift, fundamental oscillators. High activity and power output, Stands up under maximum crystal currents. Stable, long-lasting; ±500 cycles..... **$2.95** Net

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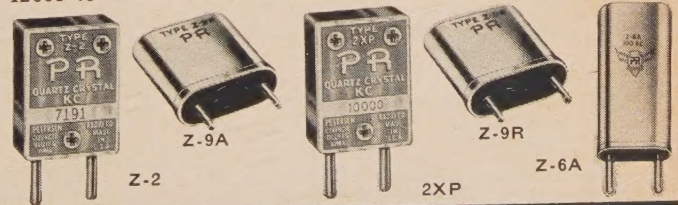

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For further information, check number 3, on page 126.

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300 West 43rd Street, New York 36, N. Y.

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Designed for

Application

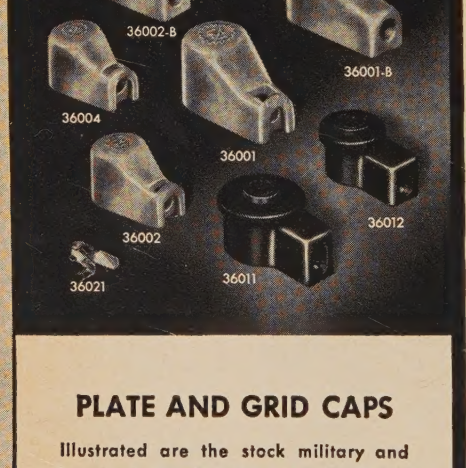

PLATE AND GRID CAPS

Illustrated are the stock military and standard ceramic Millen plate and grid caps and the snap lock caps for mobile and industrial applications requiring tighter than normal grip. Standard plate caps have phosphor bronze clips; military plate caps have beryllium copper clips.

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CQ, the Radio Amateurs' Journal is published for acti hams by active hams. CQ endeavors to be a true a honest reporter for those interested in the hobby. Sugge tions for improvement are welcomed.

Authors would do well to send for the CQ Style she which will explain our confused system of abbreviatio and symbols. The article "Author Author" (October 19 CQ) tells all about how to write artices for CQ, how mu we pay, etc. Reprints of this article are available fr CQ. if you have been improvident in keeping up yo radio library.

CQ CERTIFICATES:

The WPX Award is granted for two-way contact w certain number of amateurs in different prefixes of t world. Full details are contained in the WPX Record Bo which is available for 15c from CQ. Application for are free.

The WAZ Award is granted for contacting all of t amateur zones of the world. Current standings of amate working for this award will be found in the DX colum A DX Zone map of the world is available free from C Send stamped envelope.

Special SB Certificates are available from the Sid band Department for operators providing proof of co tact (QSL cards) with stations in 50, 75 and 100 countri using two-way sideband. Send cards directly to the Editor.

TECHNICAL INFORMATION:

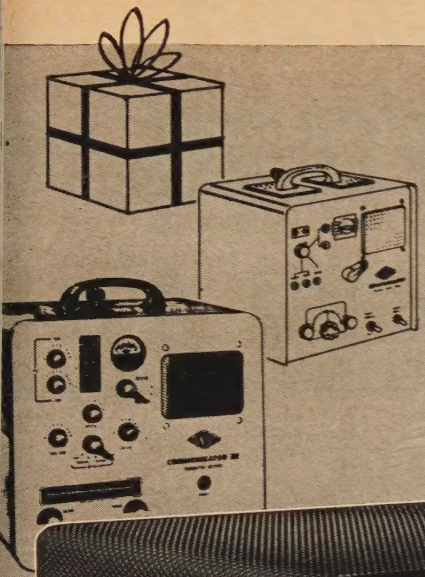
CQ's 15-year cumulative index may be obtained free fr our circulation department by enclosing a stamped, s addressed envelope (8¢). Most back issues are availab at $1 from us. Check our "Back Issue" ad for details those not available.

THIS MONTHS COVER:

Unless you are fairly young, quite agile and have lots nerve, pole climbing is better left to poor unsuspecti "friends". Page 51 describes a device which raises a lowers a good size array while maintaining contact w good 'ole terra firma. Obviously this is for hams with friends.

◀ For further information, check number 5 on page 126.

A dozen years ago . . Conset wrapped VHF into a tidy "package" and "Communicator"—the most widely used, *commercially*-produced 2-way equipment in amateur VHF history—came into being.



Down through the years, in step with VHF technology advances, Gonset has continued to set the pace with other, improved Communicators--Model II . . . Model III and now . . . again **"packaged"** for fullest operating flexibility and convenience . . .

COMMUNICATOR IV

New . . . brilliantly new . . . throughout. Handsome, industrial-designer styling provides finger-tip operating convenience—an outer housing with desirable "form factor" which facilitates carrying . . . lends itself to horizontal or vertical mounting. Now . . . **for a new decade, an even finer VHF "package", Communicator IV!**

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For the transmitter: 20 watts input . . . broad banded RF driver stages minimize tuning controls. P-P 6BQ5 modulators delivering more than 10 watts of audio. P-t-t-operation . . . high quality ceramic microphone supplied.

For the power supply: 12V DC/117V AC merely by changing cables. Transistorized DC supply eliminates vibrators.

Highlights: Frequency range, 143.7 to 148.3 mc. **Receiver noise figure,** 4 to 5 db **Sensitivity,** *0.4 μv 10 db S+N/N. Noise figure 4 to 5 db.* **Receiver tubes:** 6ER5 RF 6ER5 1st mix. 6J6 xtl osc. and multiplier. 6AV6 2nd mix. 6C4 tunable osc. 6BE6 3rd conv. 6BA6 1st I-F, 6BA6 2nd I-F, 6AV6 det.—AVC rect, 1st aud amp. 6AL5, ANL, squelch, OB-2 volt. reg.

Transmitter tubes: 6360 fin. amp. 12BY7A xtl osc—tripler. 12BY7A, tripler, 12BY7A doub-driver. 7059 speech amp.-phase inv. 2—6BQ5's P-P modulators.

Dimensions: 5"H, 9½"W, 13"D. 21.8#.

SEE COMMUNICATOR IV AT YOUR GONSET DISTRIBUTOR SOON.

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In Our Opinion . . . .

The 1st International Amateur Radio Convention scheduled to be held here in New York City, August 11-14 HAS BEEN CANCELLED.

Here is the reason:

In September, 1959, the International Amateur Radio Convention, Inc. signed a contract with the New York Statler-Hilton Hotel Convention Dept. whereby the entire Mezzanine Floor, five lecture rooms, and the Skyline Suite, were assigned for the Convention. The Skyline Suite was to be used for a series of on-the-air amateur radio stations.

In November, 1959, the Statler-Hilton management advised the Convention Committee that because of a reconstruction program, their Skyline Suite would not be available and instead the Penn Top Suite would be substituted.

Meanwhile, all plans and arrangements for the Convention were carried on by the Convention Committee. Thirty top-notch manufacturers contracted for Display booths and advance sale of admission tickets began.

Then, on May 4th the Convention Department of the Statler-Hilton Hotel advised the IARCI Convention Committee that because of additional reconstruction work planned by the Hotel, the Mezzanine Floor could not be be used during the month of August 1960 as it was to be rebuilt. The Hotel offered substitute space on an upper floor which was not at all suitable for the Convention.

The IARCI tried to find suitable convention space in another New York City Hotel, without success. Therefore, the IARCI had no choice other than to cancel the 1960 convention.

So, we apologize to all exhibitors and radio amateurs who planned to be at the Convention. We thank the many hams who have so diligently worked on various committees, and we are especially appreciative to the many fine technical speakers who had agreed to lend their services toward what would have been a terrific Convention had the Statler-Hilton Hotel not abrogated their contract.

Conventions

The month of May being as busy as it is, we have been to several conventions—notably, Swampscott and Dayton. As anticipated, the New England Division ARRL show held at the New Ocean House in Swampscott, Massachusetts was a most enjoyable affair. While we are not aware of the actual count, it seemed that well over 3000 amateurs attended the show to partake of the many exhibits and the fine technical program. The New Ocean House hotel is certainly a fine spot for a show. It borders the seashore with a picturesque view of Boston harbor. A fair portion of Boston's skyline decorates the horizon. One thing we won't soon forget was dinner at Hawthorne-By-the-Sea restaurant. Five thin CQ staffers went in and five well-stuffed (with Lobster) lads emerged. Once a year is enough for a meal like that.

Among the well known speakers at the Swampscott convention were: Frank Lester, W2AMJ of Hammarlund, Rev. Dan Linehan, W1HWK, Lt. Gen. Francis (Butch) Griswold, KØDWC of the Strategic Air Command, Fritz Franke of Hallicrafters, Andy Andros, WØLTE, of Hy-Gain, George Grammer, W1DF, Technical Director of the ARRL, Lew McCoy, W1ICP, of the ARRL Technical Staff Roland E. Scott, D.S.c, of Northeastern University, Henry Cross, W1OOP, New England ARRL Director Milt Chaffee, W1EFW, Dick Baldwin, W1IKE, Editor of QST, John Magnussion, WØAGD, of E. F. Johnson Co., Bud Drobish, W9QVA of Hallicrafters, Helen Harris, W1HOY of WRONE and CQ, and Percy Noble, W1BVR, VP of the ARRL.

There were also many group meetings, luncheon for the ladies, and of course the Grand Banquet. With the myriad of prizes given away at the show, it seems that everyone attending must have won something.

Hats are off to the Federation of Eastern Massachusetts Amateur Radio Associations and the Convention Committee chairman who made this years New England Division ARRL Convention such a whopping success. I might add that it was a particular pleasure for CQ to be at Swampscott and meet so many of our readers person to person.

On the weekend following the Swampscott show, we drove out to Dayton, Ohio to attend the annual Dayton Hamvention. Little in the way of an introduction need be said regarding the Dayton Hamvention. For several years now

[*Continued on page 100*]

FROM HEATH ....9 NEW RADIO AMATEUR KITS

GC-1
$99.95
$10.00 dn.,
$9.00 mo.

TEN-TRANSISTOR "MOHICAN" GENERAL COVERAGE RECEIVER KIT (GC-1)

An excellent portable or fixed station receiver! Many firsts in receiver design for outstanding performance . . . ten transistor circuit . . . flashlight battery power supply . . . ceramic IF transfilters. The amazing, miniature transfilters used in the GC-1 replace transformer, inductive and capacitive elements used in conventional circuits; offer superior time and temperature stability, never need alignment and provide excellent selectivity. Other features include telescoping 54" whip antenna, flywheel tuning, tuning meter, large slide-rule dial and attractive, rugged steel case in gray and gray-green. Covers 550 kc to 30 mc in five bands. Electrical bandspread on five additional bands cover amateur frequencies from 80 through 10 meters. Operates up to 400 hours on 8 standard size "C" batteries. Sensitivity: is 10 uv, broadcast band; 2 uv, amateur bands for 10 db signal to noise ratio. Selectivity: 3 kc wide at 6 db down. Measures only 6½" x 12" x 10". 20 lbs.

Heathkit XP-2: plug-in power supply for 110 VAC operation of GC-1. (optional extra). 2 lbs. **$9.95**

HD-20
$14.95

100 KC CRYSTAL CALIBRATOR KIT (HD-20)

Align or check calibration of your communications gear with this versatile ham aid. Provides marker frequencies every 100 kc between 100 kc and 54 mc. Transistor circuit is battery powered for complete portability. Accuracy is assured by .005% crystal furnished. Measures only 2½" x 4½" x 2⅝". 1 lb.

7 more kits on following pages

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$40.00 dn.
(Write for time payment details)

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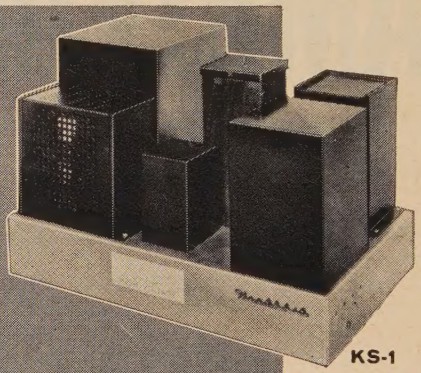
Here is a top-quality kilowatt rig with all the features you've been looking for. Operates at maximum legal power input on all bands between 80 and 10 meters, in SSB, CW or AM linear operation. Premium tubes (4-400A's), forced air cooled with centrifugal blower. Grid neutralized, continuous plate current monitoring, extensive TVI shielding. Features both tuned and swamped grid circuits to accommodate all popular exciters. Operates class ABI for SSB and AM linear service and high efficiency class C for CW service. Convenient panel controls include power switch, tune-operate switch, HV on/off switch, final bandswitch, meter switch, grid bandswitch, grid tuning, mode switch, plate tuning, plate loading and bias adjust. Accessory connectors are provided on the rear apron of the chassis for complete compatability with all control circuitry in the Heathkit "Apache" Transmitter. Two meters provided; one monitors final plate current; the other indicates switch selected readings of final grid current, screen current, and plate voltages. Send for complete specifications now. 70 lbs.

A PERFECT COMPANION FOR THE "CHIPPEWA" KILOWATT POWER SUPPLY KIT (KS-1)

Ruggedly constructed for heavy-duty use in medium to high power installations, the KS-1 fills the requirements of a top-notch power supply with economy and safety. Features an oil-filled hermetically sealed plate transformer, "potted" swinging choke input filter and 60-second time delay relay. Line filters minimize RF radiation. Maximum DC power output is 1500 watts. Nominal voltage output, 3000 or 1500 volts. DC current output, average 500 ma, maximum 1000 ma. Control circuitry is arranged to allow remote installation. The KS-1 employs two 866A half-wave mercury vapor rectifiers in a full-wave, single-phase configuration. Power requirements: 115 V, 50/60 cycles, 20 amperes; 230 V, 50/60 cycles, 10 amperes. 105 lbs.



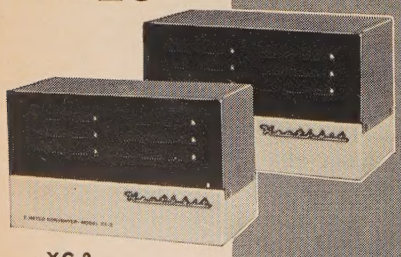
KS-1

$169.95

$17.00 dn.,
$15.00 mo.

XC-6

$26.95



XC-2

$36.95

6-METER CONVERTER KIT (XC-6)

Extends frequency coverage of the Heathkit "Mohawk" and most other general coverage receivers into the 6 meter band. Converts 50-54 mc signals to 22-26 mc. 3-tube circuit provides two RF stages and low-noise triode mixer. Calibration accuracy assured by .005% overtone crystal supplied. Provision for external RF gain control. 6 lbs.

2-METER CONVERTER KIT (XC-2)

This top-quality 2-meter converter may be used with receivers tuning any 4 mc segment between the frequencies of 22 and 35 mc when appropriate crystal is used. Converts 144-148 mc signals to 22-26 mc with .005% overtone crystal supplied. High quality parts used throughout. Silver plated chassis and shields. 7 lbs.

N KIT FORM TOPS IN TRANSMITTING POWER

'WO BRAND NEW MODELS
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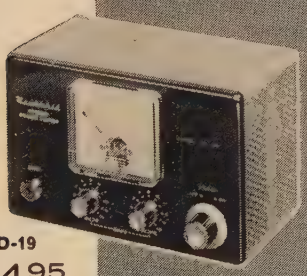
Complete ham facilities at low cost! The new Heathkit ransceivers are combination transmitters designed for rystal control and variable tuned receivers operating on he 6 and 10 meter amateur bands (50 to 54 mc HW-29 nd 28 to 29.7 mc for HW-19) in either fixed or mobile nstallations. Highly sensitive superregenerative receivers ull in signals as low as 1 microvolt; low power output s more than adequate for "local" net operation. Other eatures include: built-in RF trap on 10 meter version to inimize TVI; adjustable link coupling on 6 meter ver- ion; built-in amplifier metering jack and "press-to-talk" witch with "transmit" and "hold" positions. Can be sed in ham shack or as compact mobile rigs. Not for Citizen's Band use. Microphone and two power cables ncluded. Handsomely styled in mocha and beige. Less rystal. 10 lbs.

VIBRATOR POWER SUPPLIES: VP-1-6 (6 volt), VP- -12 (12 volt). 4 lbs. Kit; **$8.95** each, wired; **$12.95** each.

HW-19 (10 meter)
HW-29 (6 meter)
$39.95 each



HD-19
$34.95

HYBRID PHONE PATCH KIT (HD-19)

Add the thrill of phone patching to your ham hobbying, while rendering valuable public service during emergencies and in countless other instances. The HD-19 puts a top-flight phone patch in your ham shack at the lowest price anywhere! Features: voice control (VOX) or manual operation; large, easy to read VU meter for continuous monitoring of output to 600 ohm line; specially designed hybrid transformer providing better than 30 db isolation between receiver and transmitter circuit; separate receive and transmit gain controls. Switched circuitry allows VU meter to be used as null depth indicator. Provides effective match for 3 to 16 ohm speaker impedance. 4 lbs.

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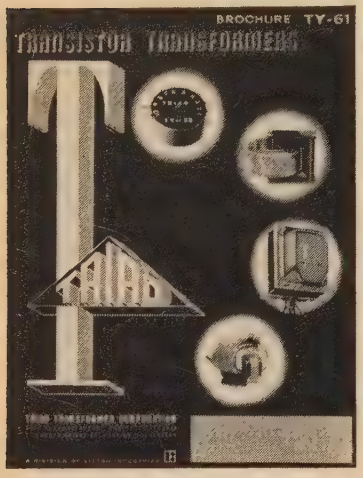

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Message From The Publisher

Only on rare or exceptional occasions do express my opinions in the editorial pages o CQ. I avail myself of that opportunity at thi time to pay tribute to a man whose contribution to amateur radio have been outstanding, bot in character and in years of service.

Today, as this issue of CQ is being readied fo publication, I learned (and confirmed) tha A. L. Budlong, W1BUD, has just informed th ARRL's Board of Directors that he will retire a year end. Mr. Budlong has served loyally an strenuously as Editor of QST and as secretar of ARRL for more than a decade. Dozens o pages of this issue would be required were w to enumerate the many fine contributions Mr Budlong has made to amateur radio, for he i one of the hobby's real pioneers.

All amateurs know that on occasion throug the years the Editor of CQ might have seen fi to disagree with some of the policies which Mr Budlong established and carried through in hi executive capacity with the League. But I per sonally would be remiss if I did not acknowledg that he always did his job well—and that as a sincere ham he rendered superlative service t the hobby.

So, I take this opportunity to express publicl my sincere farewell to a respected contemporar —a truly outstanding amateur and an excep tional personality. I have reason to believe tha these sentiments are also those of the man thousands of hams whose hobby has been mad quite a bit more pleasant through Mr. Budlong' efforts. So, W1BUD, our sincere best wishes ar with you.

S. R. Cowan ex-W2NA
Publisher—CQ

HAMMARLUND HX-500

SSB TRANSMITTER

- A 100-watt SSB transmitter for amateur and commercial use on the 3.5, 7, 14, 21 and 28 to 30 MCS bands.
- Separate dial scale for each band or portion of 10 K band.
- All crystal included for all amateur bands — nothing extra to buy.
- Frequency readability to 200 cps, or better.
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- Provides choice of upper, lower, double sideband, CW, FM, FSK for RTTY plus 40 cycle identification keyed shift.
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- Built-in antenna changeover with receiver antenna input connection.
- Adjustable RF level controls output power when employed with high power linear.
- Carrier suppression 50 db or better.
- Unwanted sideband suppression 50 db or better.
- 3rd and 5th order distortion products down 30 db or better.
- Spurious frequencies down 50 db or better.
- T.V.I. proofed.
- VOX and anti-VOX controls conveniently located on front panel.
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- RF level meter range 60 db with adjustable sensitivity control.
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- FM-FSK center frequency adjustment on front panel.
- 60 kcs filter type SSB generator.
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- Unitized construction.

$695.00 Amateur net.

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For further information, check number 9, on page 126.

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How to get a Commercial FCC License

Free . . .

Tells where to apply and take FCC examinations, location of examining office, scope of knowledge required, approved way to prepare for FCC examinations, positive method of checking your knowledge before taking the examination.

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1. Tells how thousands of brand-new, better paying radio-TV-electronics jobs are now open to FCC License Holders.
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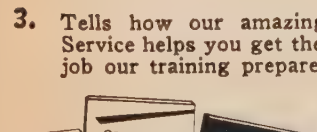

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I want to know how I can get my FCC ticket in a minimum of time. Send me your FREE booklet, "How to Pass FCC License Examinations" (does not cover exams for Amateur License), as well as amazing new booklet, "Successful Electronics Training."

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CQ-66

Letters..... to the Editor

More Incentive

Editor, *CQ:*

My compliments and agreement to Dick Hoyt, K4SCW (Letters, May, 1960) on his sentiments regarding power and privileges for the various classes of Ham licenses. And I would like to add a few thoughts of my own.

I think the power allocations should be:

Novice	50 watts Max
General	150 watts Max
Advanced	250 watts Max
Extra	500 watts Max

The maximum input levels I recommended above are prompted by comparison with the rest of the Ham world outside our own U.S. It is repeatedly evident in comments from our lesser powered foreign brethren that our 'brute' kilowatts are completely unfair to them. And this is proven quite true when we ourselves (QRP's, that is) are overpowered by a native KW. And then we also have the interesting and irrefutable fact that our foreign pals can, do, and will continue, to work the world with their low power.

Add to these facts and remarks, my recommendation that the skilled portion of our own Ham fraternity who progress to the higher classes of tickets should most certainly have privileges to match. By all means give them portions of the band as reward for their skill and efforts. The end result would be beneficial to all concerned. One more recommendation . . . any higher classed Ham leaving his privileged portion of the spectrum would have to reduce power in keeping with lesser qualified Hams with lower power restrictions. . . .

So . . . let's revise twofold: Reduce power maximums for *all* classes of Hams and reward those chaps who earn it.

Harry E. Blomquist, K6JSS
12430 Ted Ave., Saratoga, Calif.

Editor, *CQ:*

In the May issue I read with great interest K4SCW's letter with his power recommendations. I agree with him that the power input should be based on the license held, but in inverse order.

I recommend:

Novice	1000 watts Max
General	500 watts Max
Advanced	250 watts Max
Extra	75 watts Max

This is not as silly as may appear at first glance. A novice would have the KW to play around with for a year. By that time he has either killed himself or passed his test and is graduated to the 500 watt class. In either case QRM is cut down. Thus as an amateur becomes more skillful in operating he will be able to demonstrate this by using increasingly less power. So when a fellow tells you he is running 75 watts you will respect him for his ability as an "Extra Class" license holder.

In addition to the Advanced Class Amateur license, I hold a Commercial First Fone and a First Telegraph therefore under present conditions I see no incentive to get an Extra Class Amateur License.

Edward Halen, WA2HPS, Ex K5SPT, W7OBC
Brooklyn 35, N.Y.

Editor, *CQ:*

While reading your magazine I have noticed considerable writings concerning the working rules of Amateur Radio. If possible I would advocate these changes:

1. Change the license requirements
2. Change the power limitations
3. Change the frequency allocations

These revisions, I believe, would be beneficial for amateur

WHITE HOUSE ARMY SIGNAL AGENCY
THE WHITE HOUSE
WASHINGTON 25, D. C.

30 March 1960

Mosley Electronics Incorporated
4610 N. Lindbergh Blvd
Bridgeton, Missouri
ATTN: Mr. George E. Mobus

Dear Mr. Mobus:

It is with pleasure that I forward our commendations and appreciation to the Mosley Company for the service rendered this Agency during the recent South American trip of the President of the United States. The flexibility of your company to meet special requests is to be admired in this modern day of fixed contracts and production schedules.

The performance of the special TA-33 Beam Antenna was exactly as represented. Our operations and installation personnel expressed complete satisfaction regarding ease of assembly, matching, radiation pattern and the quality of workmanship especially the performance in high winds and adverse conditions.

May we in this Agency extend our personal thanks for your consideration and expediting actions which assisted greatly in making our mission a success.

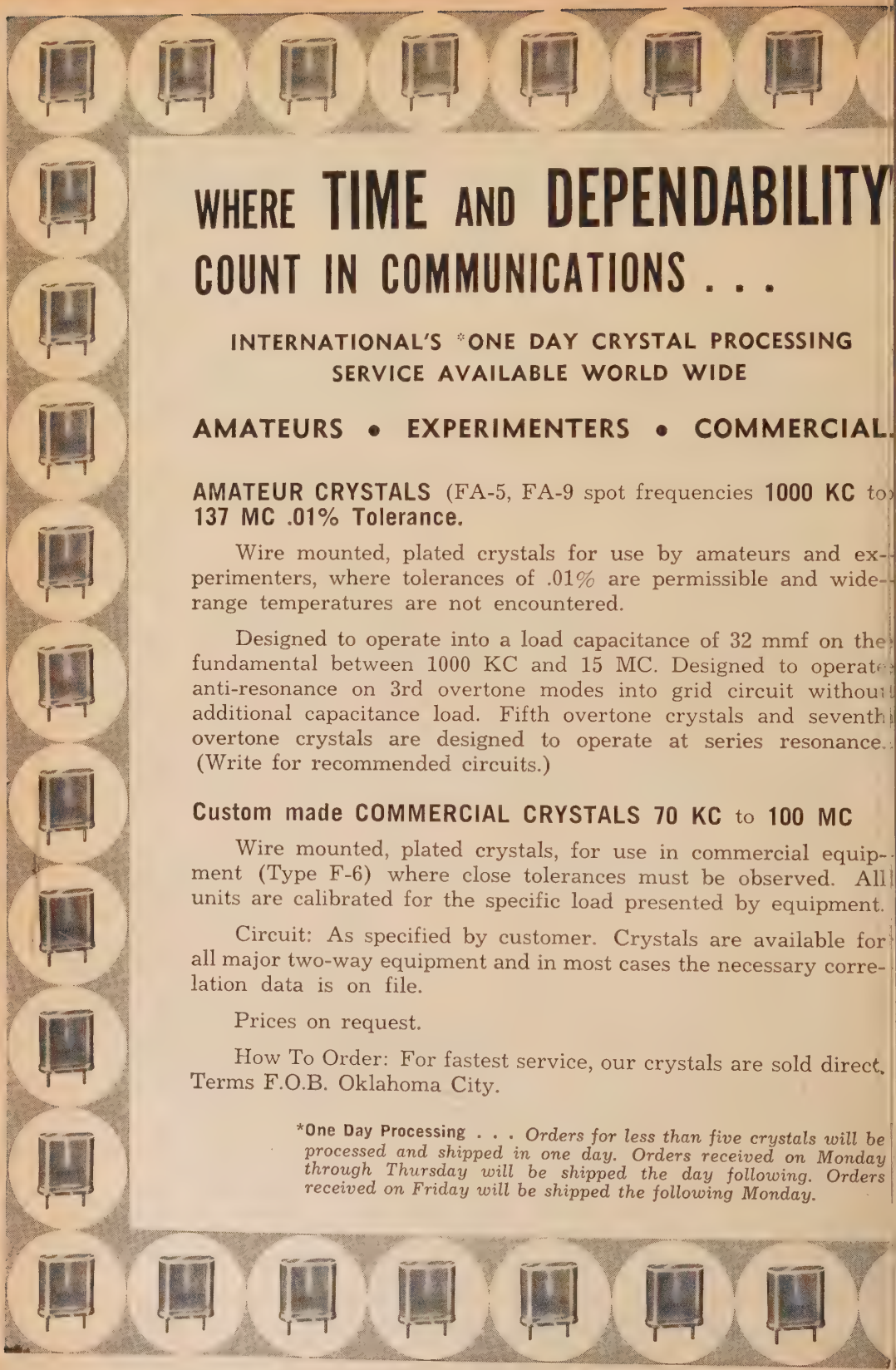
Yours truly,

Alton R Hart W4FB

ALTON R. HART
Chief Engineer
White House Army Signal Agency

(Advertisement)

For further information, check number 10, on page 126.



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AMATEUR CRYSTALS (FA-5, FA-9 spot frequencies **1000 KC** to **137 MC .01% Tolerance.**

Wire mounted, plated crystals for use by amateurs and experimenters, where tolerances of .01% are permissible and wide-range temperatures are not encountered.

Designed to operate into a load capacitance of 32 mmf on the fundamental between 1000 KC and 15 MC. Designed to operate anti-resonance on 3rd overtone modes into grid circuit without additional capacitance load. Fifth overtone crystals and seventh overtone crystals are designed to operate at series resonance. (Write for recommended circuits.)

Custom made COMMERCIAL CRYSTALS 70 KC to **100 MC**

Wire mounted, plated crystals, for use in commercial equipment (Type F-6) where close tolerances must be observed. All units are calibrated for the specific load presented by equipment.

Circuit: As specified by customer. Crystals are available for all major two-way equipment and in most cases the necessary correlation data is on file.

Prices on request.

How To Order: For fastest service, our crystals are sold direct. Terms F.O.B. Oklahoma City.

*One Day Processing . . . *Orders for less than five crystals will be processed and shipped in one day. Orders received on Monday through Thursday will be shipped the day following. Orders received on Friday will be shipped the following Monday.*

Now IN ONLY MINUTES CONVERT YOUR CAR RADIO FOR SHORT WAVE RECEPTION WITH A MOBILETTE

International's NEW all transistor, Crystal Controlled Converter.

• Easy to Install. • Works on 6 or 12 volts without change. • Power connector plugs into cigarette lighter socket. (No external power supply needed.)

Designed by International for Amateurs, Citizens Licensees, Short Wave Listeners, Hobbyist.

Available in Seven frequency ranges covering the Amateur bands, 75 through 10 meters, the Citizens band, and WWV National Bureau of Standards Time Broadcasts.

Three simple steps to install (1) Remove antenna lead from car radio and plug into input of Mobilette. (2) Plug jumper wire from Mobilette into antenna connection of car radio. (3) Plug power connector into cigarette lighter socket.

International Mobilettes cover these short wave bands.

Catalog No.	Frequency	Catalog No.	Frequency
630 - 105	75 meters (Amateur)	630 - 102	15 meters (Amateur)
630 - 104	40 meters (Amateur)	630 - 101	11 meters (Citizens)
630 - 106	10 MC (WWV Time)	630 - 100	10 meters (Amateur) 28.5 - 29.5 MC
630 - 103	20 meters (Amateur)		

Available soon for 6 and 2 meters at slightly higher price.

INTERNATIONAL CRYSTAL MANUFACTURING CO., INC.

18 NORTH LEE • OKLAHOMA CITY, OKLA.

Complete, ready to plug in and operate . . . . only $19.95

Order direct from International. Terms F. O. B. Okla. City. Include postage. Shipping weight 2 lbs.

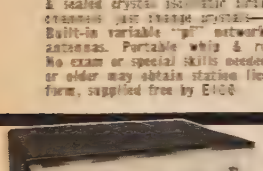
Send for FREE Catalog covering International's complete line of Crystals and Equipment.

For further information, check number 11, on page 126.

Now Your BEST BUY in CITIZENS TRANSCEIVERS... EICO

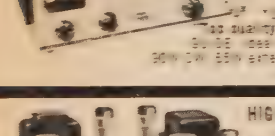
=760 (117 VAC less bracket: Kit $59.95. Wired $89.95
=761 (117 VAC & 6 VDC: Kit $69.95. Wired $99.95
=762 (117 VAC & 12 VDC: Kit $69.95. Wired $99.95

Highly versatile, extremely sensitive, professional design. Powerful 5-watt (as defined by FCC) crystal-controlled transmitter & sensitive (1 microvolt) superhet receiver with RF stage & noise limiter. Built-in speaker, detachable ceramic mike. Pre-set & sealed crystal controls for 4 channels. To change channels just change crystals—no adjustments needed. Built-in variable "pi" network matches most popular antennas. Portable whip & roof antennas available. No exam or special skills needed—any citizen 18 years or older may obtain station license by submitting FCC form, supplied free by EICO.



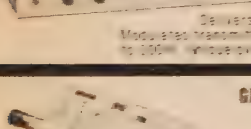
90-WATT CW TRANSMITTER* =720
Kit $79.95
Wired $119.95

*U.S. Pat. No. D-184,776
"Top quality." — ELECTRONIC KITS
Gr. DE does for veteran or novice.
90W CW 85W external plate modulation.
80 through 10 meters.



HIGH LEVEL UNIVERSAL MODULATOR-DRIVER =730
Kit $49.95
Wired $79.95
Cover E-5 $4.50

Delivers 80W undistorted audio. Modulates transmitters having RF inputs up to 1000 watts. Overmodulation indicator.



GRID DIP METER =710
Kit $29.95
Wired $49.95

Includes complete set of coils for full band coverage. Continuous coverage 400 kc to 250 mc. 500 μa meter.

NEW!

Code Practice Oscillator =706
Kit $8.95 Wired $12.95

Rugged battery-operated transistor oscillator circuit with built-in 3" speaker. Front panel (deep-etched satin aluminum) has flashing light, phone jack, pitch control (500-2000 cps), external key terminals, "temporary" key. Panel switch selects Tone, Light, or both Tone & Light. 6½" h, 3¾" w, 2¾" d.

Compare value for yourself at your neighborhood EICO dealer. Send for 1960 catalog on over 70 models of easy-to-build professional test instruments, hi-fi and ham gear. Send for FREE Short Course for novice license.

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For further information, check number 12, on page 126.

radio as a whole and would increase our Country's technical capacity, which is really the purpose of amateur radio.

The license requirements could be modified this way: Keep CW as a requirement for the beginner, this way is good because you have to learn it, there are many theoretical or technical reasons why it should be considered obsolete to have AM or SSB as a requirement so why is it any different with CW? Aren't they all modes of communication? I have known engineers who would like to be amateurs but don't like CW and so their technical knowledge and ability is denied to the amateur fraternity. Does this make sense?

Let's upgrade the present written exam for the general class license to a point between the general class and the extra class plus increasing the extra class requirements. This will accomplish the thing that CW does now and will raise the technical level of all "Hamdom."

The power limit should be decreased, between 5 and 50 mg from 1,000 watts to 200 watts. This would put us on a competitive level with each other and with DX.

The power limit should be increased to 5 or 10 KW for 50 mc and up. This will allow the VHF man to have the extra push to advance the amateur state of the art in forward scatter, moon bounce, meteor bounce, etc. All we have to do is to work at the power that the government allows in these scatter circuits to see that this added power is needed.

The frequency allocations should be changed so that the extra class license holder would have the whole gamut of 10 and perhaps a portion of each band from 6 thru 50 mc. He should be allowed to run 1000 watts on his own signal frequency only. This would perhaps be the added incentive to those who would like to work for this class license but now find it hardly worth the effort.

Thomas E. Denham, K4CHV
1221 Highway Ave., Covington, Ky.

Scratch!

Editor, *CQ*:

Returning from a 5-week sojourn in W6 and W7 land I pick up the May issue of *CQ* and can't find the most feature. There isn't even an explanation—let alone an apology—for the omission. How come?

As a continuous subscriber to *CQ* since 1945 I've stuck with the book thru thick and thin (and it's been pretty thin at times) buoyed up by Scratchi's priceless prattle. Don't let me down now. Cling to the one feature that raises *CQ* to unique eminence among good ham mags.

Carl Long, W3MRF
188 College Ave., Beaver, Penna.

Editor, *CQ*:

The May issue of *CQ* just arrived and the conspicuous absence of "Scratchi" was pleasantly noted.

Congratulations! The space can certainly be put to better use.

This was the greatest literary zero that hamdom ever produced. Frankly I doubt that the Chinese Embassy would even come to his rescue. I hope the change is a permanent one.

Now, let's head for the pass and cut off those Rush whackers who dribble out that "Citizens Band" column. What is this doing in the Radio Amateur's Journal? 11 Meters is already under fire for its exaggerated use as an examination-free amateur band. Let these guys get their own magazine. Maybe the Police Gazette will give them space.

Mel Kampe, W9SHM
615 So. Second St., Springfield, Illinois

Careful scrutiny will uncover the fact that the "Citizens Band" column has vanished.

Contest—Contest—Contest

Editor, *CQ*:

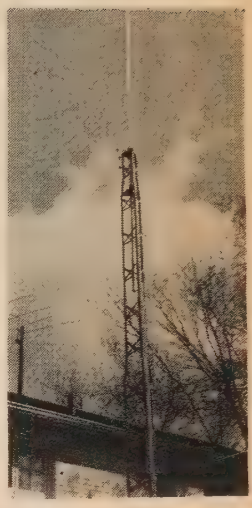
On the 23rd and 24th of April I witnessed a tragedy of our six meter band.

Many of our local hams fell victim to a hoax—where it started I know not but I suspect some ham started it by reading minds instead of the printed page. The hoax developed into a popular delusion, so strong I could not explain its untruthfulness to many of its participants.

The facts are these: On both dates I heard many hams call CQ Contest on our six meter band. I talked to two of those participating and neither knew what organization sponsored the contest or to whom the participants would submit their logs. I informed them without any success

New Amateur Equipment

Hy-Gain "Hy-Tower"



The 18-HT "Hy-Tower" is a multi-band vertical antenna system designed to work against ground or a grounding system. Through the use of the unique stub decoupling system, automatic band selection is accomplished for the 10, 15, 20, 40 and 80 meter bands. The stubs (or linear traps) effectively isolate various sections of the vertical so that an electrical quarter-wave length (or odd multiple of a quarter-wave length) exists on all bands. The overall height is 50 feet and it is completely self-supporting in wind velocities up to approximately 80 miles per hour.

On both 40 and 80 meters, the Hy-Tower operates as a quarter-wave vertical. The entire antenna is in use on 80 meters. On 40 meters the tower proper (which is insulated from the aluminum mast) acts as a quarter-wave stub or sleeve, decoupling the top mast and a quarter-wave 40 meter antenna results. On 20 meters the entire antenna is operative as a three-quarter-wave vertical. On 15 and 10 meters, the decoupling stubs are positioned at the proper points to act as phase reversal stubs and a colinear action results in a gain of 2 *db* over a quarter-wave vertical at the same height. The stub multibanding method in no way limits the operational efficiency.

Physically, the Hy-Tower is a 24 foot steel tower, topped by a 26 foot aluminum mast. The tower is only 15 inches at the base and no guy wires are required. Yet the tower can easily be installed by two men.

For the ultimate antenna system on 80 and 40 meters, it is possible to mount two Hy-Tower antennas 65 feet apart and switch the phase in order to obtain gains of the order of 5 *db* on 80 meters and 3 *db* on 40 meters.

Power capabilities is in excess of 5 *kw*. VSWR less than 2:1 on all bands relative to 50 ohms. For further information circle A on page 126.

Glass Inductors

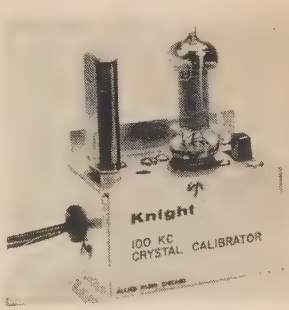
The *Corning* Standard Inductor Kit, designed to simplify and reduce the cost of experimental and limited production consists of 10 standard value glass inductors which can be easily modified to in-between odd values with four different types of cores.

The conductor coil is manufactured by applying a spiral strip of silver oxide film to the specially selected (code 7720) glass cylinder. The film is fired on, copper-plated and then tin-dipped. The coil cannot shift or work loose, the inductors can be used repeatedly for experimental purposes.

It is reported that these inductors are unexcelled for high frequency tuning applications requiring temperature stability and low loss. Operating temperature range is given as -55° to $+125^{\circ}$C. Temperature coefficient is zero to plus 20 ppm/°C. Tolerance is $\pm 10\%$.

The standard value inductors included in the kit range from .05 μh to 1.30 μh. Two each of four different types of cores are also included: red dot, 5.0 permeability; blue dot, 9.2 permeability; ¼" brass; and 3/32" brass. Mounting hardware and technical data book are also included. For further information circle B on page 126.

100 KC Crystal Calibrator



The Knight Crystal Calibrator is a compact single tube kit featuring an hermetically sealed 100 *kc* crystal which will furnish useful markers to 32 *mc*. The circuit utilizes a 6AK6 as a crystal controlled electron coupled oscillator with the output taken from the plate through 10 mmf. A 7-45 mmf ceramic trimmer is mounted inside with provisions for screw driver adjustment to zero beat with WWV. Voltages required are 6.3 v at 150 *ma* for the heaters and 150 to 300 *vdc* at 3 to 6 *ma* for the plate. The four leads entering through the grommet are filament leads, B plus and output.

The tiny chassis provides holes for bottom or side mounting. A single pole single throw slide switch interrupts the B+ for ON-OFF operation. For more information circle C on page 126.

BRING YOUR MOBILE STATION UP TO DATE!

with a compact **NEIL** *transmitter*

NO EXTERNAL B+ SUPPLY REQUIRED - JUST CONNECT TO YOUR 12v BATTERY

If you're still mounting your mobile power supply in the trunk, under the hood, or somewhere in the back seat, drilling holes for power cables, worrying about water — or doing without a mobile station because you think it's too difficult to install . . . *solve your problem with* The Neil MOBILEER 6 or 10 meter phone transmitter — a compact 20 watt unit with a

BUILT-IN TRANSISTOR POWER SUPPLY

- *front panel tuning, no screwdriver adjustments*
- *built-in tuning meters eliminate meter switching*
- *uses inexpensive low frequency crystals, cabinet 3" high*
- *built-in push-pull plate and screen modulator*
- *no tricky overtone OSC circuits, tunes in seconds*

PRICES:

MOBILEER transmitter, as above
Wired $159.00
Kit 134.00

ALPHA transmitter, 20w. Requires 300v @ 200ma.
Wired $78.50
Kit 58.50
Power Supply, fixed 39.95

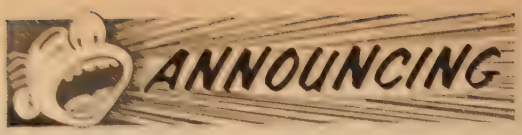
BETA transmitter, 60w. Requires 600v @ 100ma, 300v @ 200ma.
Wired $125.00
Kit 98.00

(Please specify band and filament voltage desired)

SEE YOUR DEALER FOR THESE NEIL TRANSMITTERS, OR ORDER DIRECT FROM

THE NEIL COMPANY
1336 Calkins Rd.
PITTSFORD, N. Y.

For further information, check number 19, on page 126.



Breakfast Club Hamfest

The "Breakfast Club Hamfest" third annual meeting will be sponsored by the Quad-Co. Amateur Radio Club, Inc. at Terry Park near Palmyra, Illinois on Sunday, July 31. Bring your own basket lunch. Sandwiches and soft drinks available on the grounds. Mobile talk-in on 3872 kc and 29.6 mc from 0400 to 1100. All sorts of contests and games, including golfing and fishing. Bring your Swap Gear. Everybody welcome! Registration is $1.00 in advance or $1.50 at the gate. For tickets and information write to Dale Elliott, K9SKJ, Box 134, Loami, Illinois.

Blue Ridge A. R. S. Inc.

The Fifth Annual Hamfest of the Blue Ridge Amateur Radio Society, Inc. Will be held on July 24, 1960 at Lakeside Amusement Park, located on Route No. 460, between Roanoke and Salem. Noon lunch will be available on the grounds. Registration will start at 9:00 A.M.

Graveyard Net Picnic

Fifth Annual Graveyard Net Picnic will be held on July 9th, and 10th at Jamestown in Virginia. Featuring Eyeball QSO's, QSL and Mobile Judging Contests, Drawings by-the-dozens, Auctions where you can buy, beg, sell, or swap. Games for the ladies and children.

For information and a free flyer, write Norm Reynolds, K4GKN, 86 N. Lawson Road, Poquoson, Virginia.

Wabash Valley A. R. C.

The 11th Annual VHF Picnic sponsored by the Wabash Valley Amateur Radio Association will be held on Sunday, July 31, 1960, at Turkey Run State Park, about 40 miles north of Terre Haute, Indiana near Highway 41.

This is an outdoor affair and if you do not care to bring your own basket lunch, food is available at the Park Hotel and Restaurant.

Further information is available from Ken Mier K9EFO, 2446 Cleveland Avenue, Terre Haute, Indiana.

Virginia Kentucky Ham Picnic

The Southwestern Virginia and Eastern Kentucky Ham Radio Operators are holding, what is expected to be their largest picnic ever. The place: Breaks Interstate Park between Haysi, Virginia and Elkhorn City, Kentucky, on Highway #80. Time: July 10, 1960.

No registration fee. Bring your cameras. Acres and acres of picnic grounds.

Cordell Damron, K4BGQ can give you more information by writing RFD 3, Box 555, Pikesville, Kentucky.

North Dakota Convention

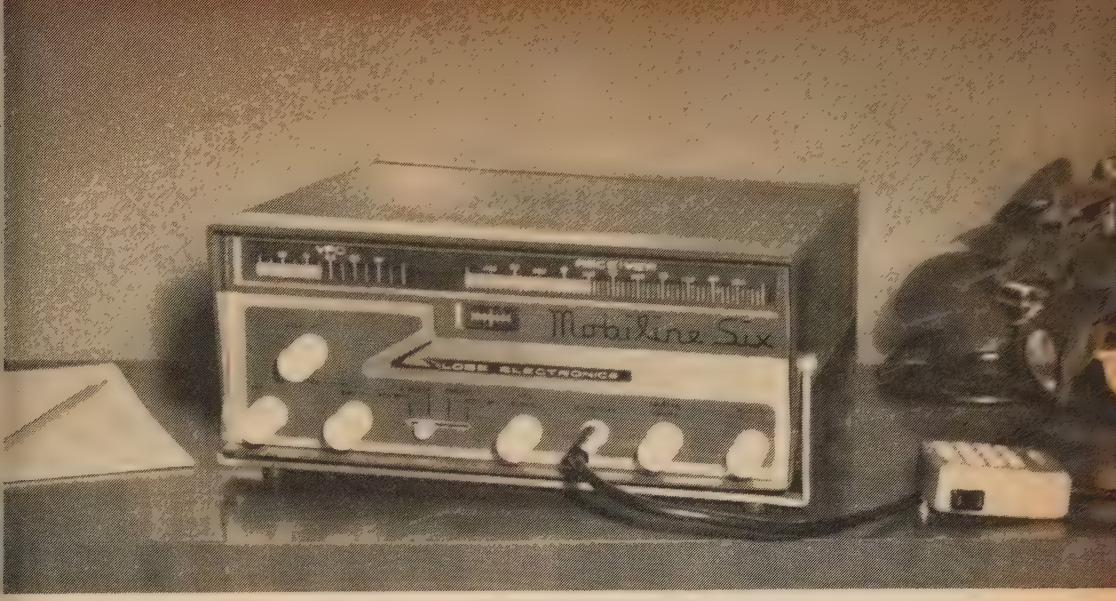
The 1960 North Dakota ARRL Convention, sponsored by the Minot Amateur Radio Association, will be held at the Farmer's Union Auditorium, 215 E. Central Avenue, on July 30 and 31, 1960.

Registration fees: $5.00 for all activities including banquet and chance at all prizes. Anyone may purchase tickets. Non-Hams: $2.50 for all activities including banquet but not main prizes. Children under 12 years old: $1.50 for all activities including banquet but not main prizes.

Tickets and/or hotel or motel accommodations should be sent in as soon as possible and not later than July 9, and may be addressed to L. E. McFall, WØGNS, Convention Chairman, 1005 9th Ave. N.E., Minot, North Dakota.

Casper Wyoming A. R. C.

The Casper Amateur Radio Club is sponsor of the Wyoming Hamfest Convention for 1960, to be held July 16 & 17, on highway 16, about 15 miles south west of Buffalo, Wyoming at the Pines Lodge. Program includes hidden transmitter hunts, contests, prizes, and XYL program. Advance registration through K7IAY, 1615 South Oak St., Casper, Wyoming. Registration fee $2.00. Write direct to Pines Lodge for accommodations, Buffalo, Wyo.



Introducing the NEW Globe Electronics Mobiline Six...

6 METER MOBILE OR FIXED STATION TRANSCEIVER CRYSTAL OR VFO CONTROLLED WITH 20 WATTS INPUT

The smartly styled new Mobiline Six is a compact transmitter and receiver combination for equal 6 meter adaptability to a fixed or mobile installation, operating from 115v AC, 12v DC or 6v DC, all with the power supply provided. It weighs only 20 pounds. Sized only 5" x 12", the unit takes little space in either home or car.

The receiver portion utilizes 7 tubes, including an RF stage delivering better than 1 mv sensitivity. A squelch control is also provided in the Mobiline Six.

In the transmitter section, the internal VFO is voltage regulated and shock mounted to provide the utmost stability under adverse mounting conditions. The 2E26 amplifier stage is conservatively operated to handle 20 watts input power.

VFO or XTAL control; "S" meter, tuning meter, slide rule dials, VFO spotting and Class B modulation are a few of the other feature highlights. Available August, 1960. $229.95.

...and the NEW Citizens Band CB-200 Deluxe and Pocketphone

CB-200 DELUXE

Two-way radio. Five channels. One tunable channel for receiving. Dual conversion. Pi net. $179.95.

POCKETPHONE

Transistorized two-way radio 1⅝" x 2⅜" x 6¼". 13 ounces. No license required. Range ½-1 mile. Rechargeable battery. $125.00.

GLOBE ELECTRONICS

A DIVISION OF TEXTRON ELECTRONICS, INC.
22-30 SOUTH 34TH ST. COUNCIL BLUFFS, IA.

For further information, check number 14, on page 126.

Tri-Ex "h" SERIES

CRANK-UP TOWERS
give you the

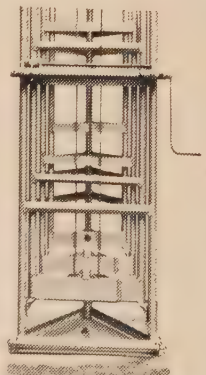
"GREATEST HEIGHT-PER-DOLLAR!"

For optimum results there is an optimum antenna height above ground. With a TRI-EX Crank-Up Tower you can pick your best height, based on the band being used, conductivity of ground and clearance of surrounding objects.

Expertly engineered, and proven through years of actual use, the "H" towers support even the largest 20 meter and tri-band beams.

New iron phosphate rust-proof undercoating, **plus** epoxy resin primer, **plus** baked enamel finish, protects tower for years of maintenance-free use.

The winch is ratchet operated, and can be locked for safety. The "H" series tower is available in 37, 54 and 71 ft. models. Towers are shipped complete with base and crank.



Priced from
$152.43

Write for full details, and for catalog showing complete Tri-Ex line . . . the "greatest Height-per-dollar" value you can buy.

TRI-EX TOWER CORP.
129 EAST INYO STREET
TULARE, CALIFORNIA

For further information, check number 15, on page 126.

Shawnee Hamfest

The Shawnee Amateur Radio Association Hamfest is to be held July 31 at the DuQuoin State Fairground. A sideband dinner will be held Saturday evening previous to Hamfest. More information may be obtained by writing Frances May, K9JJE, 807 South Russell, Marion, Illinois.

Glacier Park Hamfest

Plans are now underway for the 1960 Hamfest to be held in Glacier Park July 16 and 17. This International Hamfest, which has been an annual event for 26 years, is rapidly gaining popularity and is becoming one of the largest hamfests of its kind.

Program schedules are available from George Nichols, 1342 South 6th, West Missoula, Montana.

Central Illinois Picnic

The Radio Clubs of Central Illinois are planning the Central Illinois Radio Amateur Picnic for this year 1960. It is to be held at the 4H grounds of Allerton Park near Montecello, Illinois on the third Sunday of July, the 17th.

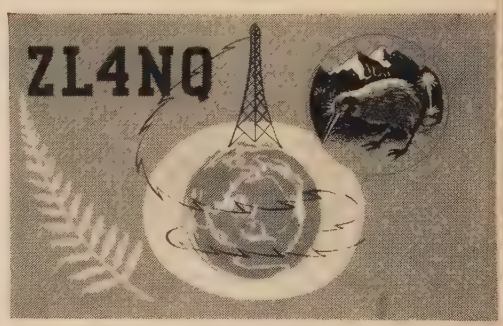
The main feature of the picnic is that it is free of charge. Lunches and refreshments will be available. There will be a drawing for the OMs and XYLs.

Gulf Coast VHF Picnic

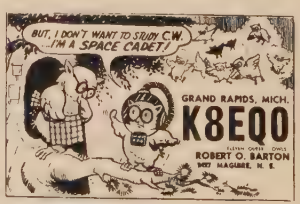
The Gulf Coast VHF Picnic will be held at the Gulf Shores State Park, Gulf Shores, Alabama on July 17, 1960. Prizes and fun for all. Bring your family and a picnic lunch. Six meters will be monitored for mobiles. For more information contact Jacob G. Thorn, K5HUW, Rt. 2, Box 161, Pascagoula, Miss.

QSL contest

Winner



Runners Up



20 db GAIN

– over precipitation static!

NEW!

Base Station
STORM⚡MASTER®
Unity-Gain Antenna

Cat. No. 175-509 STORM⚡MASTER is designed for service in areas where maximum physical strength and/or resistance to precipitation static is required. This design results in a reduction of precipitation static interference in the order of 20 db.

SPECIFICATIONS

- Frequency range . . . . . 30-50 Mc
- Nominal input impedance . . . . . 50 ohms
- Maximum power input . . . . . 500 watts
- VSWR 1.5:1
- Bandwidth . . . . . ± 1%
- Rated wind velocity . . . . . 100 MPH with ½" of ice
- Weight . . . . . 80 lbs. at 30 Mc

Communication Antenna Systems for American Business

Communication Products Company, Inc.
MARLBORO NEW JERSEY

For further information, check number 16, on page 126.

FIELD STATION ENGINEERS

Several qualified engineers will be selected to join in a program which is advancing the state-of-the-art of

IONOSPHERIC PHYSICS

and the study of

BACKSCATTER PHENOMENA

Background in these areas will be developed through a training program in our Electro-Physics Laboratories, located in Bladensburg, Maryland. Engineers selected will become part of a team extending experiments of the Research and Development Department to the field, in both Domestic and Overseas assignments, and will have ample opportunity to develop technically.

They will possess a combination of the following requirements:

- BSEE, or equivalent consisting of combined civilian or military technical school plus work experience.
- Presently employed as a Field Engineer or Project Engineer.
- A good command of some of the following:
  - —RADAR, preferably High-Power
  - —HF Long-Distance Communications Systems
  - —Tropospheric or Ionospheric Scatter Systems
  - —Meteor-Burst Communications Systems
  - —Propagation Prediction—computation of propagation for long-distance communications
  - —Ionospheric Sounder Operations
  - —RDF Systems
  - —Doppler RADAR Systems
  - —Amateur Radio Enthusiast
- FCC License, 1st or 2nd Class.

They must be willing to accept assignments in areas where dependents are not permitted for periods up to one year. Differential paid for overseas assignments.

Applications Are Also Being Accepted For

SENIOR SCIENTISTS
ENGINEERS (All Levels)
LABORATORY TECHNICIANS

for permanent assignment at our Electro-Physics Laboratories in Bladensburg, Maryland.

Please Send Resume To:

Professional Employment Dept.

ACF ELECTRONICS DIVISION

acf

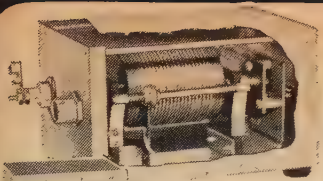
INDUSTRIES, INCORPORATED

RIVERDALE, MARYLAND

Dick Bird, G4ZU

Answer yes or no. Score 5 points per question. If you don't get over 50% you'd better start reading up on antennas and perhaps check your own, you may get a surprise. Time limit 15 Min. The answers are on page 56.

1. A half wave dipole is exactly a half-wave long.
2. A half wave dipole is always exactly 75 ohms.
3. A folded dipole made of ribbon should be cut shorter than a folded dipole made of open wire due to different velocity factor.
4. No radiation takes place off the ends of a dipole.
5. Increasing the height of a dipole above a half wave will reduce high angle radiation.
6. A dipole can be made shorter by putting loading coils on the ends.
7. With a two element beam, a reflector gives more front to back ratio than a director.
8. Ground wave range on ten meters is normally 20 miles or more.
9. Standing waves can be eliminated by carefully trimming the feeder length.
10. Coax. can-not radiate if the outer is grounded.
11. With a beam, high F/B ratio indicates high gain.
12. The angle of radiation from a beam is much lower than from a dipole at the same height.
13. Tilting a beam will lower the angle of radiation.
14. Doubling your power should double your feeder current.
15. The electrical height of a beam is often greater than its physical height above ground.
16. Putting your beam end on to your neighbor should stop his TVI.
17. An antenna 'draws' best at its resonant frequency.
18. A 40 meter dipole will work fine on 15.
19. A 15 meter dipole will work fine on 40 meters.
20. A high-quality insulator is essential at the base of a ground plane.



6 or 12 volt models

Complete **$24.95**

Automatically tunes entire band by remote control.

MASTER MATCHER & FIELD STRENGTH METER

ULTRA-HI-"Q" COILS FOR 80, 40, 20, & 15 METERS

Your Choice

$5.25 ea.

The coil with the highest "Q" ever obtained. Tested and found to have a "Q" of well over 515. Use with 36" base sect. 60" whip. 3" Dia.

NEW!

SLIM-JIM

ALL-BAND BASE LOADING ANTENNA COIL

96" WHIP

FOR 10, 11, 15, 20, 40, 80 METERS

SIZE 1⅜"x 19"

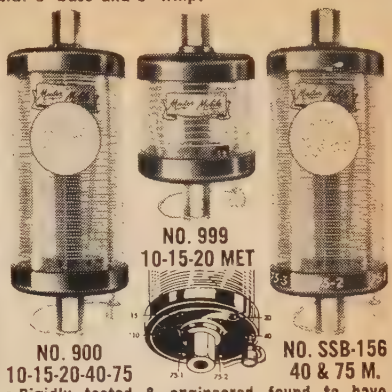
Positive action, just slide whip in or out to loading point and lock nut into position.

NO. B-1080

$17.95

MULTI-BAND ANTENNA COILS

New Plug-in type coils, designed to operate with std. 3' base and 5' whip.



NO. 900
10-15-20-40-75

NO. 999
10-15-20 MET

NO. SSB-156
40 & 75 M.

- Rigidly tested & engineered—found to have "Q" of 525
- Handles 500 Watts input
- Operates into a 52-ohm cable
- Positive contact—noisefree, troublefree operation
- Weathersealed
- Factory pre-tuned—no adjustments needed.

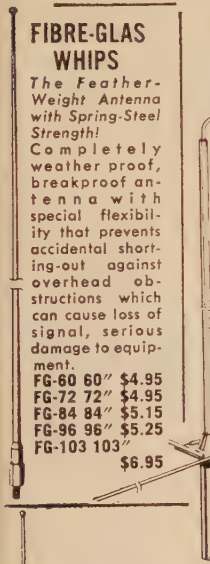
YOUR CHOICE EA **$14.95**

FIBRE-GLAS WHIPS

The Feather-Weight Antenna with Spring-Steel Strength!

Completely weather proof, breakproof antenna with special flexibility that prevents accidental shorting-out against overhead obstructions which can cause loss of signal, serious damage to equipment.

FG-60	60" $4.95
FG-72	72" $4.95
FG-84	84" $5.15
FG-96	96" $5.25
FG-103	103" $6.95



Leaders in the Design and Manufacturing of

Communication Equipment & Antennas

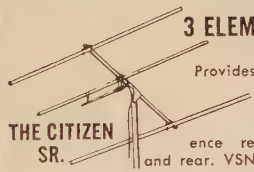
FOR LAND, SEA AND AIR

MONOPOLE ANTENNA

Folded radiating element for installation requiring a ground plane configuration and a wider useful range.

11 Met. .	$24.50
10 Met. .	24.50
6 Met. .	16.95
2 Met. .	14.95

SR-600

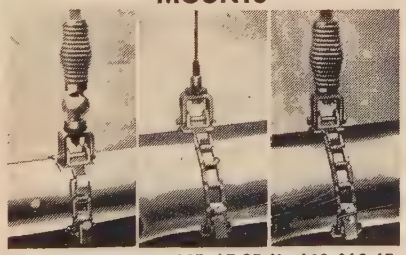


THE CITIZEN SR.

3 ELEMENT 11M. BEAM NO. SR-500

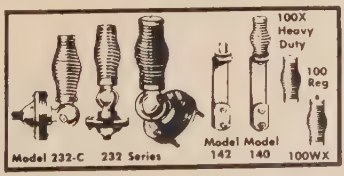
Provides a power gain of approx. 2½ (8DB) in forward direction. 10 to 1 interference reduction from sides and rear. VSNR-1. 1 to 1 at band center when fed with 52 OHM coax. . . **$36.00**

MOUNTS



No.444 $17.80 No.445 $7.95 No.446 $13.45

Adjustable to any bumper. No holes to drill.



MASTER-MAGIC WAND

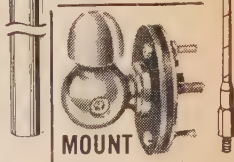
New easy-to-install, single band, top-loaded plastic covered fiber glass antenna provides maximum performance at the most useful radiation frequencies.

10 Met.- 5 Ft. L	$8.95
11 Met.- 5 Ft. L.	8.95
11 Met.-35 In. L.	8.95
11 Met.-45 In. L.	8.95
15 Met.- 5 Ft. L.	8.95
20 Met.- 5 Ft. L.	8.95
40 Met.- 6 Ft. L.	9.95
80 Met.- 6 Ft. L.	9.95

SKYMASTER COAX ANTENNA

Gets your signal through where others fail. Concentrates signals at the lowest angle, provides omni-directional pattern for best coverage. Matches RG 59/U Cable. SM-700

11 Met. . . .	$17.95
10 Met. . . .	17.95
6 Met. . . .	15.95
2 Met. . . .	10.95



MOUNT

Smaller version of Master Mobile Mounts, less spring. Swivels, mounts in all positions. ⅜"-24 thread for Magic Wand, and all Master Antennas.

No. J-11 **$2.95**

11M. CITIZEN BAND ANTENNA

40" base loaded S.S. whip antenna. Fitted with a ¼" dia. brass slug for all-purpose mounts. Low standing-wave ratio on most of band when fed with a 52 ohm coax.

8B-27 **$12.95**

CITIZEN BAND ANTENNA

26.960-27.225 MC

VSWR under 1.5:1 at resonance. Complete with 50' RG 58/U Cable. Swivel type antenna base for flat or peaked roof installation.

GP 27-11

$34.50

WRITE FOR FREE CATALOG

All products are for Universal Use-Mobile, Home, Marine, E.A.P., Civil Defense, Emergency, etc.

ELECTRONIC INDUSTRIES ASSOCIATION EST. 1924 EIA

Master Mobile Mounts, Inc.

4125 W. JEFFERSON BLVD. • LOS ANGELES 16, CALIF.

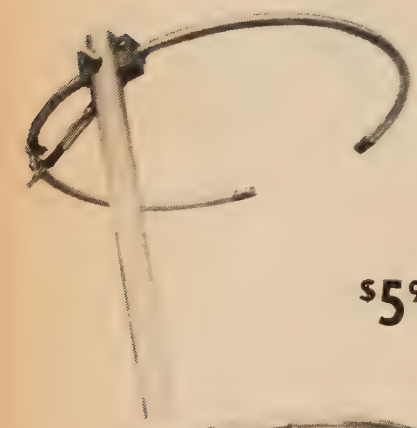
AT LEADING RADIO JOBBERS EVERYWHERE

For further information, check number 18, on page 126.

NEW
ADVANCED DESIGN

hy-gain VHF Halos

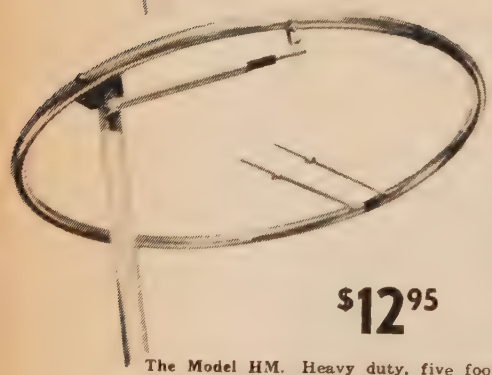
FOR 2 AND 6 METERS



$5.95

The 2 Meter Halo. Only 14 inches in diameter and weighing less than one pound, the Hy-Gain 2 meter Halo is extremely small and light weight. It is constructed of heavy wall, half inch diameter, heat treated alloy aluminum tubing. Molded high impact cycolac plastic bracket attaches Halo to any one inch mast. Perfect match to 52 ohm coax cable is made possible through the use of Hy-Gain's exclusive gammaxial gamma match system. No external matching sections required. Completely factory pretuned, the 2 meter halo is adjustable over the entire 2 meter band and provides up to 15 db gain over vertical whips when working other stations using horizontally polarized antennas. It may be stacked for an additional 3 db gain. Stacking kit complete with all hardware and matching sections. (Order 2 Model HH-2 Halos) Model HHS-2 ham net $3.00.

2 METERS
MODEL HH-2



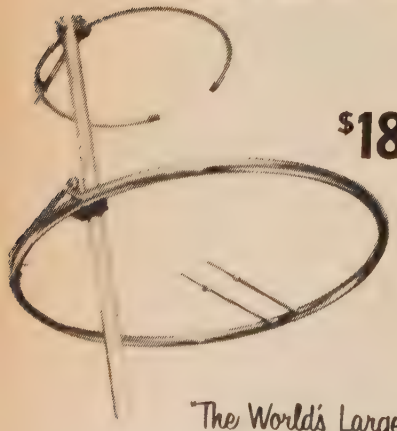
$12.95

The 6 Meter Halo. High mechanical stability with minimum wind resistance is made possible by the one inch diameter heavy wall heat treated aluminum tubing. High impact cycolac plastic bracket attaches Halo to any one inch diameter mast. Hy-Gain's exclusive gammaxial gamma match system is completely factory pretuned and provides a perfect match to 52 ohm coaxial cable. No external matching sections required. Exclusive new Hy-Gain Stub Tuning system is used to resonate Halo quickly and easily on any frequency on the 6 meter band. Its use eliminates weather problems and obsoletes difficult to adjust capacitor tuning assemblies.

6 METERS
MODEL HH-6

The Model HM. Heavy duty, five foot telescoping aluminum mounting mast complete with threaded stud for any standard mobile mount. May be used with either 6 meter or 2 meter Hy-Gain Halo stacked or single.

MODEL HM
$4.95



$18.85

The 2 and 6 Meter Halo. Unique Hy-Gain development permits combination of both 6 and 2 meter Halos to form a high efficiency duo-bander Halo for operating either band with a single coaxial feedline and low SWR. Order both Model HH-2 and Model HH-6. Supplied with simplified instructions for quick and easy assembly.

2&6 METERS
HH-2 & HH-6

hy-gain antenna products

1135 NO. 22nd ST. • LINCOLN, NEBRASKA

"The World's Largest Manufacturer of Amateur Communication Antennas"

Write for new Hy-Gain complete line catalog or see your nearest distributor

For further information, check number 24, on page 126.

IMPROVE SPEECH INTELLIGIBILITY AND CUT THROUGH QRM

SHURE *Ranger*

MODEL NO. 405T

controlled magnetic microphone with transistor amplifier

All the advantages of controlled magnetic microphone construction—ability to withstand hard usage and extremes of climate and weather conditions—are yours in this sturdy, reliable microphone. The Ranger 405T has a flat frequency response characteristic (200 to 4000 cps), controlled to provide maximum speech efficiency.

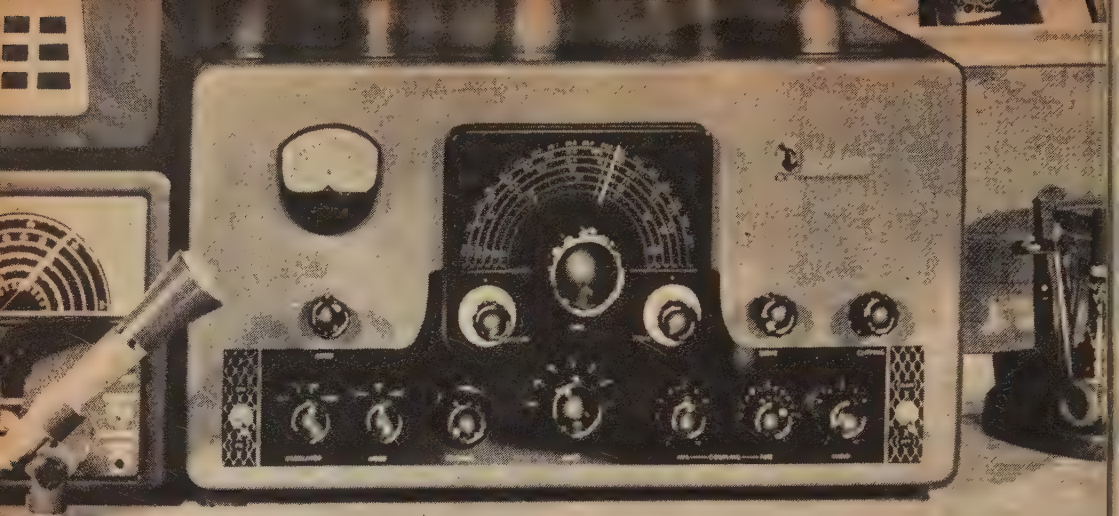
It is ideally suited for SSB-AM transmission. Fits naturally and comfortably in the palm of the hand . . . takes up minimum space in mobile or fixed-station equipment. Equipped with heavy-duty push-to-talk switch.

list price $48.50

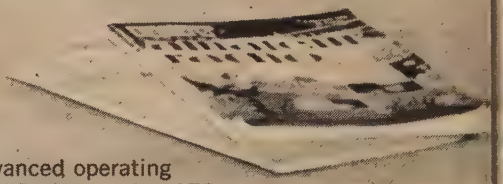
Shure Brothers, Incorporated
222 Hartrey Ave., Evanston, Ill.

MICROPHONES, HIGH FIDELITY AND ELECTRONIC COMPONENTS

For further information, check number 20, on page 126.



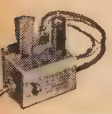
Outstanding flexibility and performance... Viking "Valiant" transmitter!



Here's effective power, wide flexibility, and many advanced operating features combined in a compact desk-top transmitter! Delivers a full 275 watts input on CW and SSB (with an auxiliary SSB exciter) – 200 watts on AM Bandswitching 160 through 10. Final amplifier utilizes three 6146 tubes in parallel. Built-in VFO or crystal control – wide range pi-network output. With tubes, less crystals.

Cat. No. 240-104-1..Kit.....Amateur Net $349.50
Cat. No. 240-104-2..Wired.....Amateur Net $439.50

Popular Johnson station accessories...

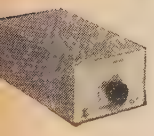


CRYSTAL CALIBRATOR – Provides accurate 100 kc. check points to 55 mc. Requires 6.3 volts at .15 amps, and 150-300 volts at 2 ma. With tube, military-type crystal, power cable and extension leads.

Cat. No. 250-28..Wired.....Amateur Net $17.95

"SIGNAL SENTRY" – Monitors CW or phone signals on all frequencies to 50 mc. without tuning. Energized by transmitter RF. Mutes receiver audio for break-in. May be used as code practice oscillator with simple circuit modification. With tubes.

Cat. No. 250-25..Wired.....Amateur Net $22.00



ATTENUATORS – Provide 6db of attenuation with required power dissipation to enable various units to serve as exciters for the Viking "Thunderbolt" linear amplifier. Dial instantly cuts attenuator in or out of circuit.

For use with Viking "Ranger" or similar unit. Provision for 75 watt bulb so unit may be used with Viking II or similar transmitter/exciter.

Cat. No. 250-42-1.....Amateur Net $21.50
Cat. No. 250-42-3..For HT-32 or similar unit...Amateur Net $21.50

New Catalog

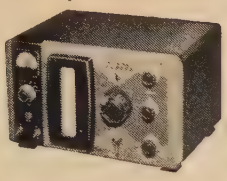
Your complete guide to amateur radio's most exciting equipment. Write today for your free copy, and you'll soon see why your best transmitter buy is a Viking!

FIRST CHOICE AMONG THE NATION'S AMATEURS

Viking

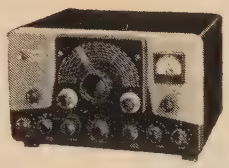
E. F. JOHNSON COMPANY • WASECA, MINNESOTA

No matter what you expect from a transmitter...
You'll get more with a VIKING!



"COURIER" AMPLIFIER – Class B linear rated 500 watts P.E.P. input with auxiliary SSB exciter; 500 watts CW; 200 watts AM. Continuous coverage 3.5 to 30 mcs. With tubes.

Cat. No.	Amateur Net
240-352-2..Wired	$289.50



"RANGER" – 75 watts CW and 65 watts phone input. Bandswitching 160 through 10 meters. Built-in VFO or crystal control. With tubes.

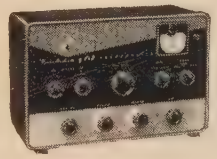
Cat. No.	Amateur Net
240-161-1..Kit	$229.50
240-161-2..Wired	$329.50

"FIVE HUNDRED" – 600 watts CW input; 500 watts phone and SSB (P.E.P. with aux. SSB exciter). Bandswitching 80 through 10. With tubes.

Cat. No.	Amateur Net
240-500-1..Kit	$749.50
240-500-2..Wired	$949.50

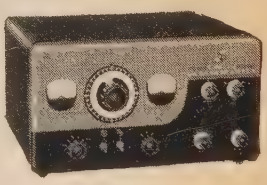
"THUNDERBOLT" AMPLIFIER—2000 watts P.E.P.* input SSB; 1000 watts CW; 800 watts AM linear. Continuous coverage 3.5 to 30 mcs. With tubes.

Cat. No.	Amateur Net
240-353-1..Kit	$524.50
240-353-2..Wired	$589.50



"6N2"—Instant bandswitching coverage of both 6 and 2 meters. Power input rated at 150 watts CW, and 100 watts AM phone. With tubes.

Cat. No.	Amateur Net
240-201-1..Kit	$129.50
240-201-2..Wired	$169.50



"6N2" THUNDERBOLT AMPLIFIER—Input rated 1200 watts P.E.P.* SSB and DSB, Class AB_1; 1000 watts CW, Class C; 700 watts AM linear, Class AB_1. Continuous coverage 6 and 2. With tubes.

Cat. No.	Amateur Net
240-362-1..Kit	$524.50
240-362-2..Wired	$589.50

The world at your finger tips!

VIKING "KILOWATT" AMPLIFIER—This exciting unit is the only power amplifier available which will deliver full 2000 watts SSB* input, and 1000 watts CW and plate modulated AM! Class C final amplifier operation provides plate circuit efficiencies in excess of 70%. Continuous coverage 3.5 to 30 mcs. Excitation requirements: 30 watts RF and 10 watts audio for AM; 10 watts peak for SSB.

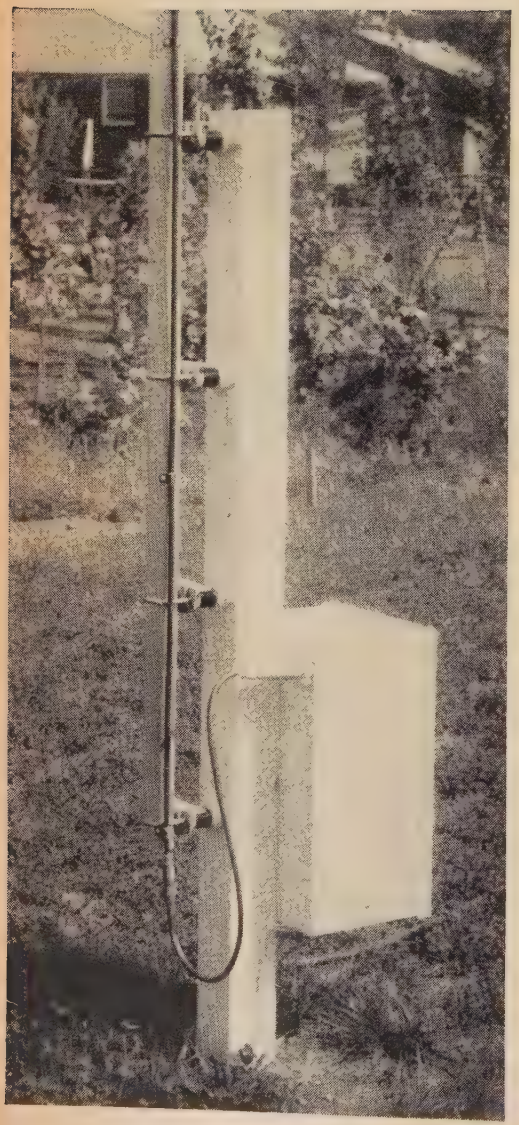
Cat. No.	Amateur Net
240-1000..Wired and Tested.....	$1595.00
251-101-1..Matching desk top, back and 3 drawer pedestal, FOB Corry, Pa.	$132.00

*The FCC permits a maximum of one kilowatt average power input for the amateur service. In SSB operation under normal conditions, this results in peak envelope power inputs of 2000 watts or more, depending upon individual voice characteristics.

For further information, check number 25, on page 126.

The Four Band Vertical DX Antenna, Mark II

Commander Paul H. Lee, USNR, W3JHR
5209 Bangor Drive
Kensington, Md.



While on duty at Charleston, South Carolina in 1952, we designed the "Four Band DX Antenna" described in *CQ* for November 1953. This article brought a flood of mail from amateurs all over the world, which proved to our satisfaction that the vertical antenna is a subject of great interest. When we moved from Charleston, we left the antenna with a local amateur, vowing that someday we would build another one and build it better. A recent move from an apartment location to a new house with a large yard gave us the opportunity we had been awaiting, and the Mark II version, described herein, is the result. The reader will quickly note the utter simplicity of construction of the Mark II, and will also be charmed by its low cost. Its appearance is very attractive also, which is a bit of an inducement for approval of the XYL, and it arouses only mild interest from the neighbors.

Review

For those who missed the original article in 1953, a bit of review of the theory of vertical antennas is in order. A vertical antenna 0.625 λ (⅝ λ) in height is at optimum for maximum low angle radiation and minimum high angle skywave. This well known fact is borrowed from standard broadcast antenna design practice. Inasmuch as our main interest is in the 14 *mc* band, we designed the Mark II to be 0.625 λ high for that band, which makes it 41 feet in height. On 7 *mc* it is 0.31 λ high, and on 3.9 *mc* it is 0.174 λ high. The two latter values are reasonable ones for those bands, and provide adequate coverage. Calculated vertical radiation patterns for various antenna heights are shown in fig. 1.

We wanted to make the Mark II self-supporting, which meant that we could not use guys as ground plane radials for a 21 *mc* antenna on top as we did in the original version. We were not completely satisfied with the ground plane anyway, as it left a lot to be desired in ease of matching and adjustment. Also, the surplus

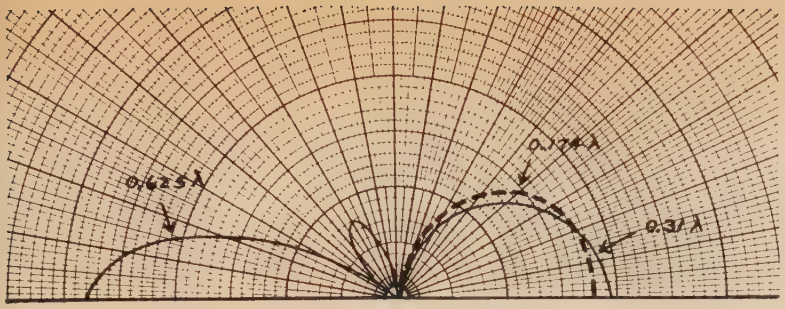


Fig. 1 — Calculated vertical radiation patterns for various antenna heights.

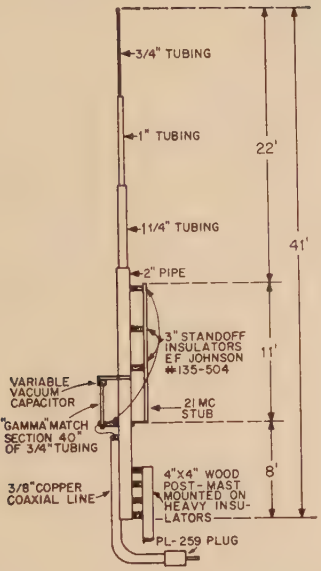


Fig. 2—Final design of the Mark II vertical.

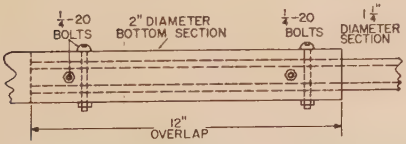


Fig. 3—Details of the 1¼" to 2" splice. Spacers described in the text, solidify the splice.

MP-48 base insulator for the 21 *mc* antenna made the whole thing rather top-heavy. The final design of the Mark II is very clean and attractive, as may be seen from fig. 2. The lower 20 feet of the mast is a piece of *Sears and Roebuck* aluminum irrigation pipe, Catalog No. 42HRM5978, found in their Farm Equipment Catalog. The current price of a 20 foot length of the 2 inch diameter pipe is $5.70. For a slight additional fee, they will deliver it on a flat-bed truck right to your yard. This pipe has a wall thickness of 0.04 inches. The upper 21 feet is made of three sections of *Reynolds* "Do It Yourself" tubing obtainable from most hardware stores at less than $2.00 per 8 foot section. We used three sizes, 1¼ inch, 1 inch, and ¾ inch. These sizes do not telescope together with a tight slip fit. We accomplished the tight slip fit by cutting 6 inches off one end of the ¾ inch and 1 inch sizes, splitting each 6 inch piece down one side with a hacksaw, and spreading it open slightly so that it fits tightly around its parent section as a bushing 6 inches long. This then takes up the slack and enables tight slip fits to be made between the three upper sections. Brass bolts, 8-32, are used to fasten these two splices. The upper 21 foot portion is then fitted into the lower 20 foot length of 2 inch pipe by means of four spacer bars made from 5/16 inch aluminum stock, one foot long, ¾ inches wide, and filed to fit the inner curve of the 2 inch pipe. Figure 3 shows the details of this splice. Four ¼-20 brass bolts 2½ inches long are used to fasten this splice.

The whole antenna weighs approximately 11 pounds, and when held horizontally by one person at the bottom end, the 41 foot length sags only about 2 feet. Yet it is quite flexible, and it will bend with a high wind and will not break. It is supported on four heavy standoff insulators made by *Lapp Insulator Co.* They are side-mounted on a wooden 4 x 4 post which is set 3 feet into the ground, and extends 5 feet above ground. The stand-off insulators are spaced 15 inches apart. The details of a mounting, which is done with a galvanized U-bolt muffler clamp and a short length of 1 inch aluminum angle, are shown in fig. 4.

21 *mc* Stub

The 21 *mc* stub on the side of the mast is made of an 11 foot 4 inch length of ¾ inch tubing, with the bottom 4 inches flattened and bent to form the mounting bracket, which is secured to the side of the mast by four self-tapping screws. Three 3 inch *E. F. Johnson* standoff insulators are used to hold the stub rigidly to the mast. Each insulator is first mounted on a strap of 16 gauge aluminum which goes around the 2 inch mast, and then the stub is secured to the other end of the insulator by means of a screw through the ¾ inch tubing. Three insulators are required to hold the stub to the mast. This prevents changes in spacing as the mast sways in the wind, which would result in detuning on 21 *mc*. This stub which is connected to the mast at a point 33 feet below the top, and the mast itself, make a "J" antenna of the basic type shown in fig. 5. The upper 22

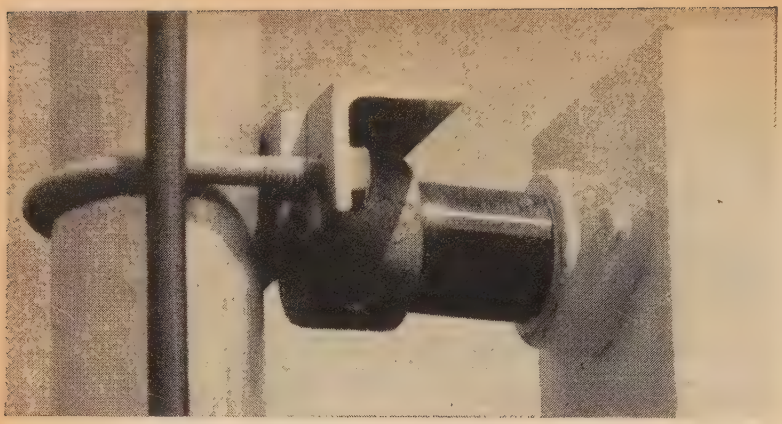


Fig. 4—Photo of the U-bolt mounting. The 1" angle iron is secured to the Lapp #13981 standoff insulator. A 1" x ½" x ¼" spacer bar is placed between the mast and angle iron. (The Lapp Insulator Co. is located in LeRoy, New York.)

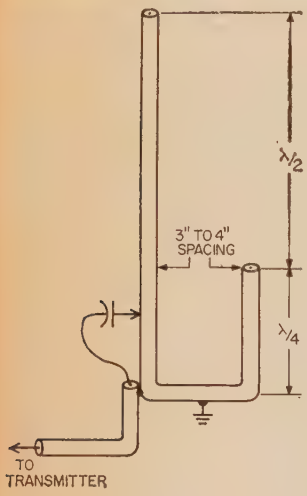


Fig. 5—Typical "J" antenna. This is formed by the 21 mc stub. The capacitor shown is the vacuum variable in the Gamma match.

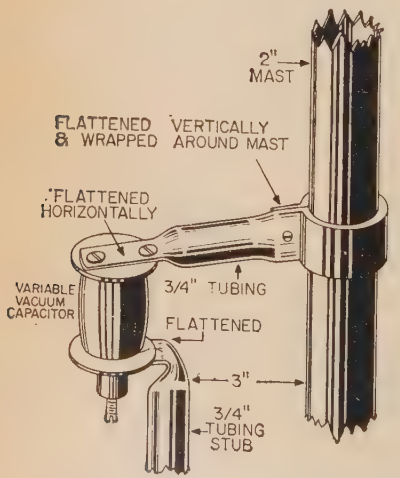


Fig. 6—Detail view of the Gamma match vacuum variable mounting.

feet of the mast acts as a ½ λ vertical antenna on 21 *mc*, and this is fed by a ¼ λ section, 11 feet long, shorted and grounded at the bottom. The coaxial feedline is connected to the antenna side of the ¼ λ section through a sliding 40 inch "Gamma match" section made of ¾ inch tubing and using a *Jennings* Type UCSL 4-250 mmfd 3 KV variable vacuum capacitor. One side of this capacitor is supported by a wrap-around strap bracket made of flattened ¾ inch tubing. The rotor side is fastened to the "Gamma match" tubing. The bottom of the "Gamma match" slides in a fitting mounted on another 3 inch insulator. The coaxial feedline runs down the mast from the bottom of the ¼ λ section, and the outer conductor is connected to the mast every two feet. This copper coaxial line is the feedline for the 21 *mc* "J" antenna, and also acts as the lead in for the whole vertical antenna on 14, 7, and 3.9 *mc*.

Tuning Unit Construction

We used the same feeding and matching arrangement on the Mark II as we used on the original version in 1952. The coaxial line is made of ⅜ inch copper tubing with RG-8/U inner conductor and dielectric pushed through it. This copper coaxial line with polyethelyne dielectric is then wound up in the form of an inductance for the tuning network for the three lower frequency bands. It also acts as coaxial feedline for the 21 *mc* "J". The schematic of the tuning network, with circuit constants, is shown in fig. 6. A heavy duty 4 position rotary

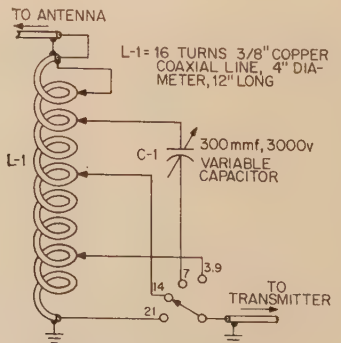


Fig. 7—Schematic of the tuning unit. This is housed in the watertight enclosure mounted on the 4" x 4" base post shown in the photo on page 28.

switch with ceramic insulation is used to shift the incoming feedline to the tap points for 14, 7, and 3.9 *mc*, and to the feedline connection for 21 *mc*. The flexible tap leads are made from RG-8/U copper braid, and are connected to the inductance by Mueller No. 45C copper clips. The jaws of the clips must be spread slightly to fit the ⅜ inch tubing. The tuning unit is mounted inside a 12 x 22 x 12 inch aluminum box, with a homemade watertight cover which has a rubber gasket cemented around the inside edge. A view of the tuning unit housing on page 28 is shown in the photograph. The coaxial inductance and the *E. F. Johnson* variable capacitor are mounted on 3 inch standoff insulators. Copper strap ½ inch wide is used for connections. The lead in insulator is an *E. F. Johnson* Type 135-67-2, whose hole is just the right size for a tight fit for the coaxial line. Caulking compound seals the tubing in the hole and seals the insulator to the box. Type PL-259 plugs, with a PL-258 adapter, are used to connect the outgoing coaxial line to the coaxial feedline on the mast. The incoming coaxial line which is buried out from the house is connected to the tuning unit through a PL-259 plug which mates with an SO-239 chassis type fitting in the bottom of the tuning unit box. The tuning unit is side-mounted on the 4 x 4 post, about a foot above the ground.

Radial System

There is a buried ground system consisting of 300 feet of #9 aluminum wire (*Sears and Roebuck* clothesline), around the base of this antenna. In our yard we were able to get in two 60 foot radials, plus six 30 foot radials, spaced every 45 degrees. These are all tied together by means of solderless connectors underground at the base of the mast, and two of the radials are left long enough to be brought up to the bottom of the tuning unit where they are connected to a ¼-20 brass bolt. The head of this bolt, inside the box, is connected to the bottom end of the coaxial coil outer conductor by means of a heavy copper strap, which is soldered as well as bolted in place under it.

Adjustment

Adjustment of this antenna on all bands was done with the aid of a *General Radio* Model 916A Radio Frequency Bridge, using the station *Collins* 51-J2 receiver and LM Signal Generator. A complete frequency *vs.* impedance measurement was made on the antenna alone, and the results are plotted in fig. 7. These resistance and reactance curves conform quite closely to Schelkunoff's predictions in his book, "Antenna Theory and Practice," (pages 438 and 439) wherein he discusses and plots impedances of cylindrical antennas for various values of Ka, where $Ka = 120 \log e\frac{2L}{A} - 120$. L is the length of the antenna and A is the radius of the antenna. An average figure is used for the A of this antenna for the computation.

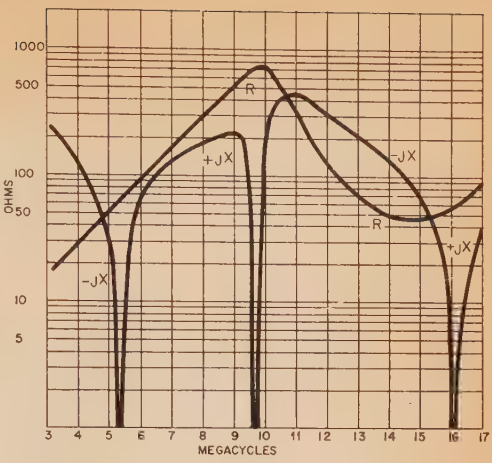


Fig. 8—Impedance curves for the Mark II.

The bridge was connected to the input of the tuning network by means of a PL-259 plug. With the switch in the 21 *mc* position, the vacuum capacitor mounting bracket was slid up and down the mast, thus adjusting the length of the "Gamma match", and the vacuum capacitor was tuned, to give an input impedance of about 51 + j0 ohms. This simple sentence sums up about two hours of climbing a ladder, adjusting, climbing down, reading the bridge, climbing the ladder, adjusting, climbing down, reading the bridge, and so on! This is not a simple operation. It requires patience! The final adjustment of the vacuum capacitor is very critical. All we can say is that if you try it, the adjustment probably will be a bit different from ours, but the vacuum capacitor bracket should be about 3 feet up from the bottom of the stub. Start with more length than this, and work down to it slowly. The variable vacuum capacitor is just hung there on its mounting bracket, right out in the weather. After all, it is made of heavy glass, so why cover it? The weather can't do it any harm.

The next operation, after you have recovered from the ladder climbing detail, is to throw the switch to the 3.9 *mc* position and adjust the taps on the coil for 51 + j0 ohms input. This inductive loading arrangement is quite frequency sensitive, so pick the frequency you use most. In our case we set it for the middle of the phone band. The feedline tap and the turns-shorting tap are adjusted for 3.9 *mc*. The *vswr* rises a bit when the transmitter is tuned to 3.8 or 4.0 *mc*, but not excessively (less than 2.5 to 1). The turns-shorting tap is then left alone in all subsequent adjustments. In our case, we had 14½ turns left in the coil, with the feedline tap 3¼ turns up from the bottom.

It was impossible to obtain exactly 51 + j0 ohms, but we ended up with 48 + j8.6, which

[*Continued on page 125*]

Antennafax

A. B. Jones, Capt. USN, K9LKC

Transmission lines: advantages, disadvantages, matching and feeding are discussed herein. A few facts not often mentioned, regarding the Cubical Quad are also reviewed.

Transmission lines, between the antenna and radio apparatus, have become almost standard practice by radio amateurs today. The days of the "Marconi" or "endfed" antennas are almost nonexistent, especially on the higher frequency bands.

The function of a transmission line is to transfer energy, from the radio transmitter to the antenna or from the antenna to the radio receiver, in the most efficient manner. There are basically three types in common use, namely: the open wire evenly spaced line, the coaxial type and the insulated close spaced wires either twisted or parallel to each other. Each has its place depending upon cost, efficiency and impedance. These can be tabulated in the following table:

Transmission line	Cost	Efficiency	Impedance (ohms)
Twisted pair	Low	Low	50-150
Parallel pair	Low	Fair	50-300
Open wire pair	Moderate	High	150-800
Coaxial (Solid Dielectric)	High	Good	40-100

The coaxial transmission line has the advantages that is is not affected by ice, snow and rain and if properly terminated does not radiate energy. Higher efficiencies can be obtained with sealed air or gas insulated coaxial lines but these are not too practical for the average radio amateur. Likewise, wave guide lines are impractical except at super high frequencies.

Losses

The energy lost in a transmission line is due to its resistance, dielectric and radiation. The resistive loss is a function of the conductor size and material and of course the frequency of transmission. The dielectric loss is likewise a function of the insulating material, the *rf* voltage and frequency. The radiation loss is very low in a well balanced and properly terminated line. In a coaxial cable it is zero because all the energy is within the outer shield. The losses in decibels for various transmission lines is tabulated in various radio handbooks.

Impedance Matching

All of the above losses assume that the transmission line is terminated in its characteristic impedance (Zo). When a line is not so terminated, energy is reflected at the termination and results in standing waves and consequently increased losses. Therefore, obtaining the best possible impedance match is highly desirable. A perfect match dictates a resistive load equal to the lines characteristic impedance (Zo) and balanced or unbalanced feed depending upon the type of transmission line chosen.

For simplicity let's take a dipole composed of two quarter wave colinear conductors and feed this with a transmission line. The impedance at the center is resistive for the single frequency for which it was cut. The value of this resistance varies with the height of the dipole above ground. Let's assume that the height above ground is about one half wave length, then this resistance becomes about 70 ohms. Therefore, to perfectly match this dipole a balanced transmission line with characteristic impedance of 70 ohms is required. Open wire line with its high impedance is impractical therefore either twisted insulated pair or parallel insulated pair is required. Coaxial cable of 70 ohms impedance can be used but we are then feeding the balanced antenna with an unbalanced line. The use of such an unbalanced line at eighty or forty meters is not too serious but at higher frequencies there will be antenna currents on the outside of the coaxial cable which will distort the radiation pattern of the antenna. It should be noted that with the proper feed line there exists but one frequency (i.e. the resonant antenna frequency) at which a perfect match obtains. By making the elements

of the antenna thick, that is one or two inches in diameter, the amount of mismatch is greatly reduced as we move either side of the resonant frequency. If we stay within 3 or 4 percent of the resonant frequency the standing wave ratio and reactance introduced will not be serious as far as efficiency and transmitter loading are concerned.

Feeding Methods

We can now consider a dipole made of one single conductor a half wavelength long. By moving out from its center the impedance increases until at the end of the antenna it is exceedingly high. This large variation of impedance permits a variety of feed points. Open wire line can be tapped symmetrically with respect to the center of the dipole to equal the characteristic impedance of the line. This may take the form of a "Delta Match" or "Tee Match" with a good balanced feed and little reactance introduced. We can also use coaxial cable with the outer conductor connected to the center of the antenna and the inner conductor tapped out from center to a point equal to the coaxial cable's impedance (Zo). This form of feeding is often called a "gamma match" and permits unbalanced line to feed a balanced dipole. In tapping the center conductor of the cable out from the middle of the antenna a small amount of inductive reactance is introduced which can be cancelled by a capacitor in series with this lead. This is best accomplished by initially using a variable condenser and obtaining the best standing wave ratio. Having determined the correct capacitance value, a good weather proof fixed condenser may be substituted. Standing wave ratios approaching one to one are easily obtained at the antenna's resonant frequency. By making the antenna elements thick (1½" to 2" in diameter) standing wave ratios *(vswr)* better than 1.5 to 1 can be achieved for most amateur frequency bands. The above techniques are often used with multi-element yagi type antennas, the only difference being that the presence of directors and reflector lowers the impedance of the driven dipole by a factor of about 4 to 8 depending upon the number of elements and their spacing.

By using what is commonly called a "bazooka" it is possible to go from unbalanced transmission line to balanced feed and visaversa. Likewise it is possible to use a transmission line transformer to match a given line to an antenna feed point of different impedance than the characteristic impedance of the line. These are adequately covered in the handbooks and have their place in certain antenna systems. In general, however, it is better if practicable to avoid them because they add another variable and often destroy the broadbanding of the antenna system. This is why the "gamma", "tee" or "delta" matches have become favorites.

Having decided on the method of feeding the antenna the question is often asked, what about the length of the transmission line? Also we hear of many amateurs who have pruned their feed line and obtained a lower standing wave ratio and the transmitter loading has been improved. It is a fact, however, that if the feed line is terminated in a non-reactive impedance equal to its Zo then the length of the line will make absolutely no difference in the *vswr* or the transmitter loading. With any given antenna system the above conditions only exist at the single designed frequency. At other frequencies, even though a small percentage removed, there will be introduced, a change in resistive component and plus or minus reactance. With good broad band design of the antenna system, the impedance which the transmitter "sees" will not vary sufficiently to prevent proper transmitter loading. However, many transmitters will not properly load if the *vswr* is greater than 2 to 1. Should this condition exist then it is possible to prune the line and load the transmitter. This pruning changes the reactive component and gives a false impression of lowering *vswr*. It may be said, however, that operation in this fashion is often quite effective because the efficiency of transmission has not suffered too much. One should always remember that the Standing Wave Ratio of the line is determined at the feed point of the antenna and nothing at the transmitter end can change this.

All amateur antennas are a compromise because they are designed for a band of frequencies instead of a single frequency as is done in commercial practice. However, by broad banding techniques and proper feed line matching the efficiency should suffer very little and loading of a transmitter of good design should be possible in any given amateur frequency band. ■

Quadfax

Many articles have appeared in the various amateur publications regarding the Cubical Quad antenna. The claims and data have often been misleading and sometimes erroneous. The recent publication *All About Cubical Quads* by W6SAI is perhaps the most accurate and authoritative treatment of the subject.

Gain

The gain of Cubical Quad over a half wave is about 6 *db* which is nearly equivalent to a two element yagi beam. The performance of a two element Quad, however, appears to be superior under most conditions. This is believed

[*Continued on page 98*]

A 17 Element Long Tom 2 Meter Beam

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Long Beach, California

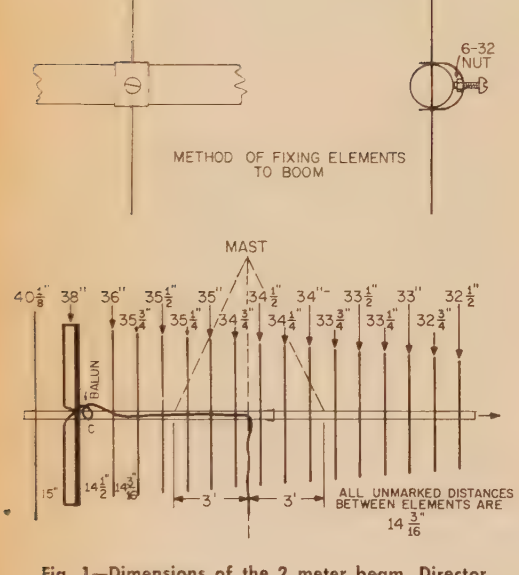


Fig. 1—Dimensions of the 2 meter beam. Director and reflector elements may be made of heavy galvanized clothesline wire. The boom should be supported at the center of balance with the diagonal supports spaced 3 feet apart. The boom is made of 2 ten foot lengths of STEEL TV masts. Aluminum will not support the load.

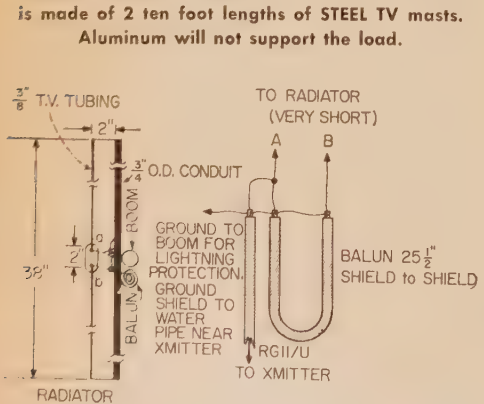


Fig. 2—Radiator and balun dimensions. When securing the balun to the boom place the coax ends point down. Roll the balun into a coil for convenience.

As an ardent 2 meter enthusiast whose contact with *vhf* dates back more than twenty years, I wanted an antenna sufficiently directive to "get me over the hump" at the home QTH in Long Beach, California where Signal Hill and Wrigley Heights tower above me. This discourages 2 meter contacts like an infuriated wife. The wife I could pacify, but governing authorities would take a dim view of my removing such valuable real estate as Signal Hill and Wrigley Heights. The obvious answer was an antenna with extremely good gain. Being of indirect Scotch descent, I didn't wish to encourage the XYL's wrath by spending a fortune on one of the commercially available beams.

Design

After starting with a copy of the VHF handbook and perusing a number of other references, I made a tentative design consisting of two *steel* TV masts, each 10′ long, which were spliced together at the swedge. The prototype was mounted about 10′ above the top of the roof so that with a small ladder I could cut and prune to my heart's delight. Much credit must be given to the Southern California hams who gave me hundreds of comparative reports as I hacked away at my Frankenstein.

After about six months of cutting, pruning and starting from scratch repeatedly, I finally arrived at what I consider the most satisfactory combination of compromises possible. The result is shown in fig. 1. Approximate antenna gain is 17 *db*.

Construction

The reflector and directors are made of plain galvanized clothesline wire. A 50′ roll is sufficient, but before attempting to cut into proper lengths, it is suggested that one end be tied to your car FRAME and the other end to a sturdy tree. Stretch the wire slightly. This will eliminate the tiresome necessity of straightening each element.

The radiator can be made of a piece of ¾′′ conduit bolted to the boom. The balance of the radiator is made of standard TV tubing connected to a regular TV antenna insulator. (See fig. 1.)

The balun is constructed as shown in fig. 2.

[*Continued on page 98*]

The Hula Hoop Antenna

Ron Chrisley, KØVBZ
3439 Main
Topeka, Kansas

Things happen when you build a Hula Hoop. his unusual circular antenna is recommended nly to the stalwart experimenter willing to bear nxious looks from the XYL and suspicious ares from the neighbors. Local hams will in- ariably find some pretext for a nervous visit your shack. The actual construction is quite mple, rapid, and inexpensive, however. The nished product should do much to boost both our morale and signal reports.

Characteristics

This antenna may be thought of as a folded ipole expanded to circular shape. The Hula loop does have some characteristics of the olded dipole. The feed point has an impedance f 300 Ohms, affording an easy match to the ransmission line. A voltage node exists at the op of the loop, permitting direct attachment to grounded mast. Please note, however, that the amiliar "doughnut" radiation pattern of the alf-wave dipole differs from that of the Hula loop. The latter gives a "figure-eight" radiation attern in both the horizontal and *vertical* cross ection. This gives an increase in gain of 1 *db* lue to the concentration of radiation in the hori- ontal plane. Low angle noise pickup is corre- pondingly reduced.

The circular antenna does not function in the ame manner as the loop commonly used for irection finding applications. The *df* loop, vhich measures much less than one wave length, ives a null for a signal source broadside to the lane of the antenna. (The incident wavefront triking the loop induces energy of equal phase n both sides of the antenna, resulting in cancel- ation.) The Hula Hoop is nearly a half wave- ength in diameter, which causes out of phase oltages to be induced as shown in fig. 1.

The circumference of the Hula Hoop may be omputed from the usual formula for a half-wave length in free space. Circumference also equals pi times diameter; by combination we have:

$$\text{Diameter (feet)} = \frac{313.2}{\text{Frequency (Megacycles)}}$$

A 10 meter antenna might be 10½ feet in diameter, for example. For the 6 meter band this value would be only 6 feet.

Variations

Endless experimentation is possible. A simple Channel 13 antenna bent from coat hangers has displayed sharp directivity and offers a convincing demonstration of the existence of space nodes, by the way. A 54 inch length of wire is adequate. Make a Super Hoop by placing two loops back to back, spaced one quarter wave length apart, and feeding them as shown in fig. 2. This gives a unidirectional pattern. Parasitic elements do not seem to work well in actual practice. The author is presently constructing an antenna dubbed—you guessed it—the Super Duper Hoop, using the collinear array for 2-meters described in the *Handbook*. Three collinear elements can be bent into circular form and joined by an additional quarter-wave phasing section. It is worthy of note that at one-third the designed frequency this antenna would operate like the simple loop, since the phasing sections would be only a small fraction of one wave length. The resonant frequency would be lowered somewhat, but the radiation pattern would be virtually unaffected.

A loop with phasing loops is interesting in itself—and new possibilities await the experimenter. The circular antenna has apparently been neglected for many years; perhaps *you* could contribute to present knowledge. Now if a circle were to be stretched into a helix . . . . ■

Fig. 1—Out of phase voltages exist (maximum sensitivity) with loop broadside to the signal source.

Fig. 2—Two loops back to back and 90° out of phase give undirectional pattern.

Lightning Protection For Your Station

William I. Orr, W6SAI/3A2AF

I've only had one brush with lightning—but that was enough to last all my life! It was many years ago, but it seems as if the startling experience happened only yesterday. . . .

It was the fall of 1935 and I had just completed a new breadboard transmitter for 20 CW. This was the rig to end all rigs! Wired in the approved buss-bar style, complete with brown beehive insulators and copper tubing coils, the final 203-A tube ran a cool 180 watts input. "Enough power to blast the eardrums of J2GX and VU7AF", I though to myself as I plugged the 14,399 *kc* crystal into the UX-247 oscillator circuit and proceeded to UX-247 oscillator circuit and proceeded to tune the transmitter up for the first time.

The *pièce-de-resistance* of the station, however, was the brand-new *Johnson-Q* antenna, proudly slung between two forty foot wooden masts firmly planted in my parent's back yard flower bed. This antenna, this transmitter, plus the new *RME-69* receiver would certainly put me at the top of the DX list! Who knows: I might even work 90 or so countries (unbelievable, but possible!) and get on the DXCC honor roll of those approaching the fantastic total of 100 countries worked!

This beautiful pipe dream was brought to a crushing conclusion on a day in late September when the sky darkened and a strange hush fell over the land. I had not lived for years in the New York area (I was a W2 at the time) not to know the signs of an approaching thunderstorm, but I delayed closing down the station, searching for the elusive and never-to-be-forgotten DX until the blasts of static in the earphones drove me from the receiver.

My first indication that all was not right with the world came when I turned the receiver off. I happened to brush my hand against the open wire antenna line and I received an unpleasant shock. No doubt about it, the antenna was "hot" with static electricity! A heavy drumming sound of rain on the roof of the radio room announced that the storm had at last arrived, accompanied by a shattering peal of thunder and a blinding flash of lightning.

A sixth sense told me that I had better get out of the room in a hurry. A funny buzzing noise started to come from the rear of t receiver and the earphone caps seemed to ting on my head. I threw the "cans" to the tab and ran out of the room, not bothering to tu off the rest of the radio equipment or the ligh The house shook with repeated barrages thunder, as if an unearthly cannonade wou blow the building to bits. The lights dimm as a nearby lightning bolt struck some impo tant power line. I observed with horror th my prized *Johnson-Q* antenna glowed in purple light as if beset with witches or e spirits, and I would be less than truthful if did not state that I was scared silly. The noi and power of the storm seemed to envelop m and stifle my breath.

At once there was a tremendous flash befo my eyes and I was deafened by a thunderbo that felt as if it had crashed at my feet. I ha been hurled to the floor, for as my sens returned, I found myself at the foot of th sofa in the adjoining room. I must have la there for some time, for when I gathered m wits and stumbled to my feet the storm ha subsided, all but for a few rumbles of thund bringing up the rear of the receding storm The rain had stopped and the air was co I seemed to be unhurt. I rushed into the rad room to see what had happened to my belov station during this outburst of nature. At fir glance, all looked well, even though an ove powering odor of decay and smoke hung in th air. Looking around carefully, however, observed that the antenna and feedline ha completely disappeared, leaving only a fe blobs of molten copper on the carpet to sho where the feedline had run from the windo bushing to the station equipment. The *RME-6* receiver was cooked to a crisp, and looked li it had been salvaged from the Chicago fir It was reduced to junk. The transmitter ha been partially demolished by the blast, m beloved and cherished 203-A was blasted molten glass and the copper conductors most of the power leads had been melted b the bolt, leaving the flacid insulation hangin between various stages of the transmitter lik damp spaghetti. In short, the transmitter w ruined.

The lightning bolt had wreaked its vengeance ɔon the rig, then had rushed about the room, arring and searing the furniture and walls :fore it had escaped by another window. All as chaos and disorder. Even so, I was thankful be alive after such a startling and heart opping experience! I sighed, as I thought of e rebuilding task ahead of me!

* * * *

Once the lightning bolt has hit your antenna stallation, or the building housing your sta-on, there is little you can do about it! The t is in the fire, so to speak, and your only ish should be to remain alive! However, if ɔu *see* the flash and *hear* the bolt, you have robably survived the stroke! The one you *on't* see and hear is the one that does you in!

Lightning Protection?

An ounce of prevention, as the old saying oes, is worth a pound of cure. With a little orethought you can make your station *look a ttle less attractive* to a lightning bolt, although here is not much you can do when several illion volts at a hundred thousand amperes re headed in your direction.

The ideal lightning proof antenna is one hat is completely at ground potential and that cts like a lightning rod, dissipating the charge n the atmosphere safely to ground (fig. 1). ou can achieve this situation with a metal ower, well grounded at the base, supporting n all-metal array that is bonded to the tower. o allow the driven element to be grounded, n indirect feed system, such as the *gamma* or *mega* match should be employed. With an rrangement such as this, the tower and an-enna act as a simple lightning rod, and the anger of a direct stroke is minimized.

If the antenna array is such that the elements re not grounded, or if the tower is made of vood, it is a wise idea to install some form of ightning protection, as shown in fig. 2. The enters of the reflector and director are bonded ogether by a heavy wire, and are also bonded o both halves of the driven element via two eavy duty solenoid type *rf* chokes. The ground-ng wires then run down the legs of the tower one wire to each leg) and are attached to round rods driven into the soil beneath the ntenna. Bonding wires should be heavy, and #8 wire is recommended. Any amateur who ives in the country can quickly visit the near-st barn and observe the grounding and bond-ng system used with the lightning rods nounted on the roof of the barn. The system ust described is a simplified copy of the farm-r's lightning protection.

Wire Antennas

Wire antennas (dipoles, Marconis, ground planes, etc.) can be protected in much the ame way by grounding the antenna element hrough a heavy duty *rf* choke that will drain

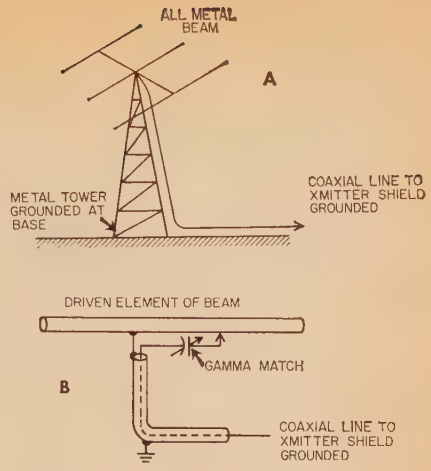


Fig. 1—An all metal beam mounted on metal tower that is grounded at the base (A) provides maximum lightning protection for your station. The coaxial line may be run along the surface of the ground or buried beneath the soil. Use of gamma match on driven element (B) ensures that all points of feed system are at ground potential.

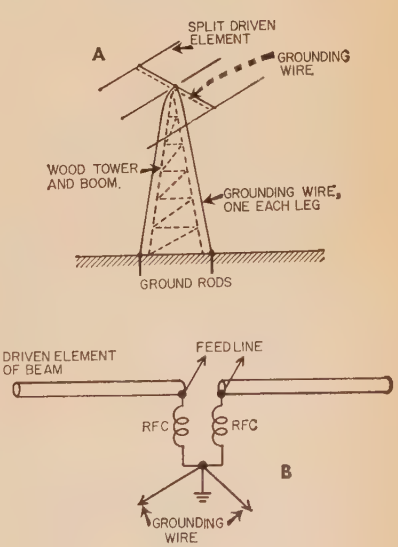


Fig. 2—A wooden tower and composite beam can be protected against static charges by placing bonding wires on each leg of the tower. Wires run to rods driven in the ground at each leg. Elements of beam are bonded to ground wires by bonding wire running along boom (A). Split driven element is protected by grounding chokes (B). Transmitting-type chokes (Barker & Williamson type #800) should be used. Place chokes in plastic box or refrigerator jar to protect them from the weather.

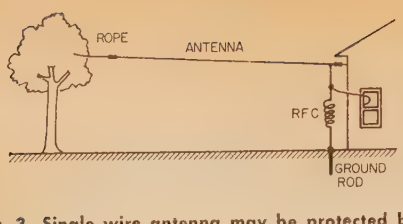


Fig. 3—Single wire antenna may be protected by use of grounding choke placed at point antenna enters house. Choke will drain off static charges built up during thunderstorm. Transmitting type choke (Barker & Williamson type #800) should be used.

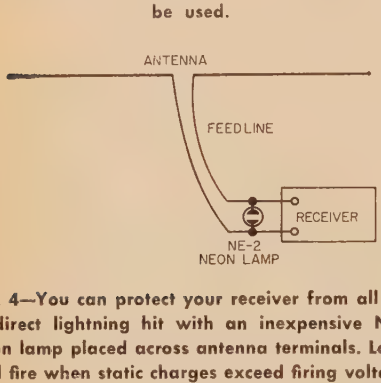
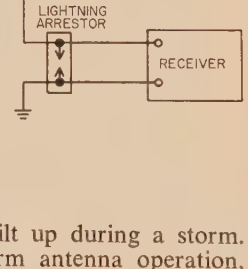


Fig. 4—You can protect your receiver from all but a direct lightning hit with an inexpensive NE-2 neon lamp placed across antenna terminals. Lamp will fire when static charges exceed firing voltage, protecting input circuit of receiver from excess voltage.

Fig. 5—Simple lightning arrestor is a gap connected between antenna and ground. When static potential applied across gap exceeds breakdown voltage, the arrestor fires and resulting spark produces low impedance path to ground. Modern "T-R" switch used in radar sets is improved version of the lightning arrestor.



off the static charge built up during a storm. The choke will not harm antenna operation, and may be left permanently in the circuit (fig. 3). Small receiving type chokes won't stand the gaff, as a sudden surge of current will burn them out, or collapse the windings. Use a good, transmitter type *rf* choke, such as the one specified in the illustration for best results. Place the choke at the antenna, or at the point the lead-in enters the house. Run a good, heavy ground lead from the choke to a ground rod driven in the earth directly below the antenna, or lead-in position.

Protect Your Receiver

One of the nastiest side effects of a thunder storm is the havoc that a near-hit of lightning can cause in a receiver. The continual bursts of high energy in the vicinity of the receivi antenna cause unusually high currents to flo in the antenna circuit, with the very goo possibility that the antenna coil of the receiv will be burnt to a crisp, even though there no actual lightning damage to the station. Sta dissipation chokes and grounding systems w do much to eliminate this trouble, but the devices are not foolproof as the energy of t storm has many devious ways of seeki ground potential. A simple device that w protect the receiver input circuit from sta electricity is the common and lowly neon bu One should be chosen that does not have resistor in the base (some do!). The cheap a plentiful surplus *NE-2* lamp will perform t task. Indeed, it is used in the input circu of the type *SCR-274-N "Command"* receive for this very purpose. Place the neon lam across the input terminals of your receiver shown in fig. 4. It will in no way hinder i ceiver operation, and when the input volta exceeds the firing voltage of the lamp, it w light up, protecting the delicate "innards" the receiver. As an extra bonus, it will al protect your receiver from overdoses of *rf* fro your transmitter!

Lightning Arrestors

As a callow youth I remember my profou disappointment when I bought a lightni arrestor for a shortwave receiver for eig cents, and opened it only to find that the su posedly exotic protection circuit was noth but a simple gap between the terminals of t arrestor! However, that's all there is to t story, as shown in fig. 5. When the sta potential applied across the gap exceeds t breakdown voltage of the gap, the arrestor fi and the resulting spark produces a low i pedance path to ground, protecting the equi ment on the far side of the arrestor. The usu breakdown potential of the garden varie arrestor is of the order of several hundr volts, or more, and in many cases the receiv can be damaged at some lower static volta that will not energize the gap. The solution this problem is to use an arrestor having adjustable gap that may be set narrow enou to protect the equipment, yet not flash ov when *rf* from the transmitter is applied acr it.

Ordinary "receiver type" arrestors cannot used with coaxial line, but at least one man facturer has a coaxial type arrestor that m be safely used with 52 and 75 ohm coax lines and has an adjustable spark gap.

Grounding the Antenna

Let's face it! All these ideas and devic will do some good to protect your stati against static discharges, and may induce t lightning to expend itself elsewhere. But if y DO get a direct hit by lightning all the arre ors, ground rods, spark gaps, and other gadg

[*Continued on page 117*]

A Turnstile Antenna For 2, 6 and 10

Charles J. Schauers, F7FE*

For the 2, 6 and 10 meter bands I have tried out a large number of antennas. Little did I expect the Turnstile antenna to perform as it did. Although horizontally polarized, the pattern obtained is essentially that shown in fig. 1, and approximates 360° coverage.

Looking at fig. 2, we see that the antenna is fed to give a phase shift of 90° between each radiating element.

Each element is cut for ¼ wavelength. If it is desired to conserve space and/or to contribute to overall installation sturdiness, you can obtain the necessary length by adding vertical arms (of equal length)—either up or down—to each element. Try to keep the arms *below* ⅓ of the overall element length.

A measurement of field strength will disclose that it will be equal to the *field* when a broadside measurement to one of the dipoles is made. At any other point, the field strength will be equal to the vector sum of the *fields* radiated from the dipole at that particular measurement angle.

Feeding the antenna is not tricky. Again, referring to fig. 2, you will see that the transmission lines are fed in parallel.

The transmission line characteristic impedance actually matches each of the input impedances of the separate dipoles. Careful selection of coaxial cable is essential.

For proper termination, the feed portion of the transmission line (where it connects to point "X") should have a characteristic impedance *about* ½ of the two lines. If 72 ohm coax is used, the long-run line should be about 36 ohms. But having no 36 ohm coax, I used 52 ohm with good results in the lower part of the 10 meter band. On 2 meters, the results were not outstanding. Paralleling a 72 ohm coax line to a 52 ohm section was not practical.

On 6 meters I had better luck with the 72-52 ohm combination. But with a carefully designed balun, I managed to use the antenna on 2 meters very successfully.

Although the Turnstile antenna is not new, not too many hams have tried it.

But when band conditions are good you can work nearly anything you hear. At least it is very simple, inexpensive and worth a try. How about the Turnstile?

Let me know. I've had phenomenal luck with it! ■

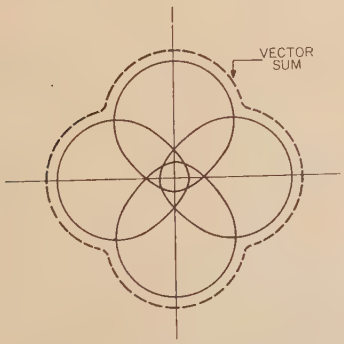


Fig. 1—Radiation pattern of the turnstile antenna. It provides almost a perfect 360 degree coverage.

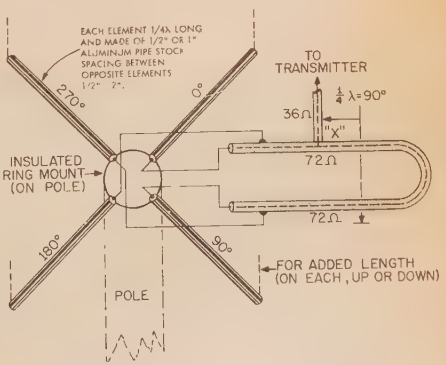


Fig. 2—Turnstile antenna dimensions for 2, 6 and 10 meters.

Constructing An Inexpensive 15 Meter Beam

W. E. LaFarra, W5ZCC
P. O. Box 43
McGehee, Arkansas

Beams are very much desired when operating the high frequencies. One of the most popular bands in the last few years has been the 15 meter band. Desiring to operate some 15 we decided to try our hand at constructing a beam. After reading beam theory we decided that it should not be too hard and would offer some construction fun in the building.

Materials

Our choice was a three element beam. Checking the dimensions, we figured we would use light material to save weight, and we could then purchase all material locally. Thin wall conduit was chosen for our elements and was readily available locally. About the cheapest boom material suitable was TV mast extension sections. These came in 10 foot lengths and 1¼ inch in diameter. Since we had chosen three elements, our boom would have to be at least 14 feet. This necessitated buying two 10 foot lengths. Using this for a boom allowed us to use TV hardware, "U" bolts, etc., which also solved the problem of mounting the elements.

Thin wall conduit also came in 10 foot sections. Our elements were to run in the vicinity of 21 feet. We finally decided to purchase 3 sections of ¾" tubing. Placing these in the center of the boom would give us five feet either side of the boom and provide strength. This meant we needed approximately 6 feet either side to make up the necessary length. Since ½ inch tubing was the next useable size and would telescope nicely into the ¾" center sections, we purchased these in 10 foot lengths also. Now this meant we could purchase 3 sections and by cutting them in two it would give us the approximate length needed. However, we would have to add small sections to prune the elements to necessary length. This may be kept in mind and could result in a saving if economy is the problem, however, the extra mechanical difficulty may offset this gain. By purchasing sections there is no mechanical problem and the correct length is easily reached.

Construction

With the tools and materials we adjoined to the back yard. Here the material was placed in what appeared to be a beam, and some thought was given to the means of clamping the beam together. One of the problems was getting the ½" and ¾" sections together with a good joint. This was solved by splitting the ends of the ¾" pieces two ways and back about 3 inches (fig. 1). By cutting the slots wide enough and applying an adjustable pipe clamp we could form a tight joint that was satisfactory. I might say now, that after the beam has been checked, these joints should be soldered or several self-tapping screws applied to make a good electrical joint. Using regular TV mast clamps and "U" bolts the ¾" sections are mounted to the 1¼" section used for a boom. Since the boom was to be fifteen feet long, two sections of mast extension

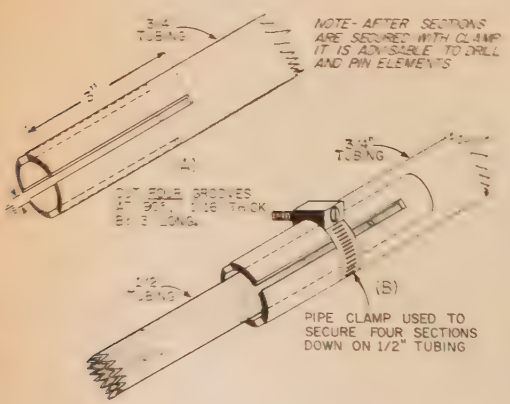


Fig. 1—Details of the ¾" to ½" junction. Pipe clamps plus self tapping screws provide strength.

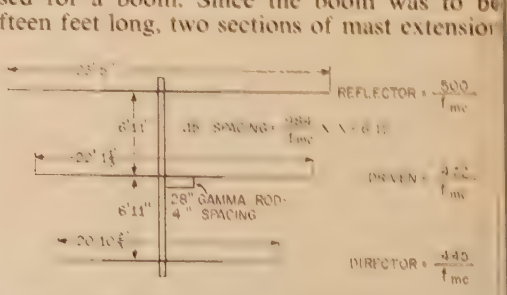


Fig. 2—Dimensions of the 15 meter beam. For element and Gamma match construction details see text.

vere used; and the unnecessary five feet was removed with a hacksaw and saved for later use. The joint in the boom was secured with several self-tapping screws. Some care should be used in finding the center of each ¾" section, and on either side of this mark a hole should be drilled to accommodate the "U" bolts. The elements are adjusted to the necssary length and the pipe clamps tightened. The element spacing is adjusted to 6' 11" and the "U" bolts tightened. A careful check of the overall dimensions is now performed to be assured that everything is ok.

Matching Systems

While there are many good matching systems, we felt that the gamma would be best suited to our beam. A small length of ½" tubing makes a good gamma rod. This is applied to the driven element. A lot of different lengths and spacings can be used, but by following ours some time should be saved in final adjustment. Basically the gamma is a means of transforming the low Z (15 to 20) up to 52 or 75 ohm coax, whichever is preferred.

Using insulation, in our case two strips of polystyrene, we insulated one end of a 33" section of ½" section, and at 28 inches we made a right angle bend and then turned up a lip to secure this end to the bam with a self-tapping screw. This gave us a gamma rod 28" with a spacing of 4 inches. We connected a variable condenser between the center of the croax and gamma rod, one lead to the rod and the other to the center of the coax. The purpose of this condenser is to cancel out the reactance. The shield of the coax is then connected to the center point of the driven element. The variable is a small spacing, 12 to 200 mmf capacitor.

Adjustments

While there are several different ways to work out the matching system, we found, after trying several suggested methods, that by connecting the beam to the transmitter and using low power or a tune-up position, the transmitter was loaded as best could be. A standing wave bridge is a necessity, and one can usually be borrowed from a willing friend. This is connected at transmitter end and a reading taken. For this we needed the beam placed in its final resting place, or as many hams do, on a step ladder. We choose the step-ladder and placed the whole shebang on the house. This would let us make our adjustment and also allow us to make some "on the air" checks before placing the beam on the tower.

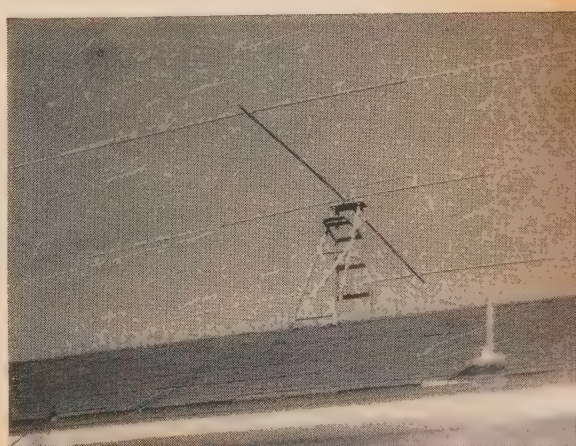
Our first reading was high, as yours probably will be too. These readings should be made at the frequency for which the beam is cut, 21.3 in our case. Adjust the variable condenser to obtain the lowest reading. The safest way to do this is: turn the rig off, move the condenser one way slightly, then reload the rig, and take a new *swr* reading. While this method is slow, it does give you constant check on many variables and keeps out some possible operator mistake that might slip in otherwise. After the minimum reading is obtained with the variable condenser, (which in all probability will not be a satisfactory *swr*), the next step will be to move the tap where the gamma rod is connected to the driven element. Only a slight movement will be needed, and the *swr* reading should be noted, taking into consideration that the rig and bridge will have to be readjusted. If the *swr* goes up, you have moved in the wrong direction and the tap will have to be moved back past the original point and slightly beyond. A new reading should disclose a lower *swr*. By touching up the variable condenser this can be improved. Following this procedure of tap adjustment, then variable condenser, the *swr* can be brought to a perfect match 1:1. The variable condenser is now sealed in a small plastic box which may be taped to the boom. One will find that the *swr* will change only slightly in the process of mounting permanently.

Mounting

Each tower will offer its own mounting problems, and possibly other means will have to be worked out to suit the individual location. In our case we used a section of 1¼" TV mast as a mounting stub. By using the surplus 5 foot section and a TV mast clamp and "U" bolt, we mounted this section perpendicular to the boom and just off-center with the major portion stick-

[*Continued on page 119*]

Two locations for beam adjusting. Take your pick.



More Watts From Your Halo

Russell M. Summerville, K8BYN
Rt. 3, Highway M-40
Niles, Michigan

How to construct and adjust a simple, inexpensive and effective impedance matching device that raised the output of the authors halo 9 db.

Don't throw away your halo yet. Read my story and you won't. A couple years ago I went on 6 meter mobile using a whip antenna. The results I had were good but like most hams I wanted to do better. I sent for a halo and when it arrived lost no time in making up the suggested balun and getting the thing installed on the car, following the directions carefully and tuning the halo for minimum SWR which was quite low.

I operated with this arrangement a couple months and the reports received were that my signal was about the same as before but with a lot less flutter. About this time my XYL decided if the halo was no better than the whip why did she have to ride around underneath it? Obviously something had to be done. A little testing seemed in order.

I drove the car to a spot about a mile from the home QTH and transmitted a signal, first on the whip and then the halo. I shorted out the antenna not under test so the unused antenna would not effect the field pattern of the one that was transmitting. Also the whip was cut exactly to frequency for maximum field strength. At the receiver end the *rf* gain was adjusted for an S9 reading from the whip signal. When the same amount of power from the transmitter was fed into the halo there was only an S8 reading on the receiver. I decided that the balun was not the right length I proceeded to make another. This time instead of cutting the balun to the number of inches stated in the instructions I fed a signal into the feed line with a crystal oscillator at 50.2 megacycles and set up a field strength meter some 30 feet away. I chopped away at the balun length an eighth of an inch at a time and each time connected it up to the halo and took a strength reading. Slowly the meter reading rose higher and higher. Suddenly with one clipping the meter gave a much lower reading. I had reached the correct spot and cut beyond it! Repeating the process with a new balun I clipped a sixteenth of an inch at a time and when I reached the peak reading I had before I stopped. (How can you tell exactly where the peak is without going thru it?) I found the length of balun for best match to be almost 2 inch different from that stated in the instructions th come with the halo. I later tried 2 other bran of coax and found each to be still different, po sibly because of a different V.P. factor. Su that the halo would now be ready to make a l of DX contacts I drove back to the test poi Now the receiver showed the same reading f the halo as the whip. This was a gain of 5 or equivalent power increase of 3½ times. spite of this success I was still getting no mo *rf* from the halo than the whip. Surely the ha should do better.

The Problem

The balun as a matching device is useful on for matching multiple impedances. Could it that the halo itself wasn't matching the balu I spent a lot of time in the next few mont checking the impedance of all the halos I cou get my hands on. I found that none of the measured alike, but they averaged about 1 ohms. Since no balun could match either a or 75 ohm line to 130 ohms another way matching had to be found. One important fun tion of the balun is to match the unbalanc feed line to a balanced antenna, and howev the antenna is matched this must be done.

The Solution

By this time K9GPS, who had been havi the same trouble matching his halo had becom very much interested in the problem. We g together one night and before we knew it w had spent all night carefully and tediously tryi several methods of matching the halo, all which were unsatisfactory for one reason or a other. Then we hit on the idea of trying a auto-transformer. With this device we could a complish the function of matching the unba anced feed line to the balanced antenna and st have a very satisfactory way of exactly matc ing any line to any antenna. The "Auto-coi described here is the result of our experiment It increased the signal from the halo by 9 over that of the whip antenna! This is the equi alent of increasing your transmitter output

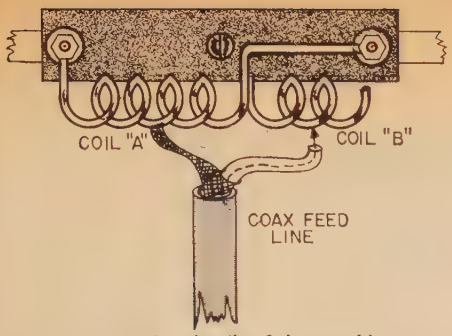
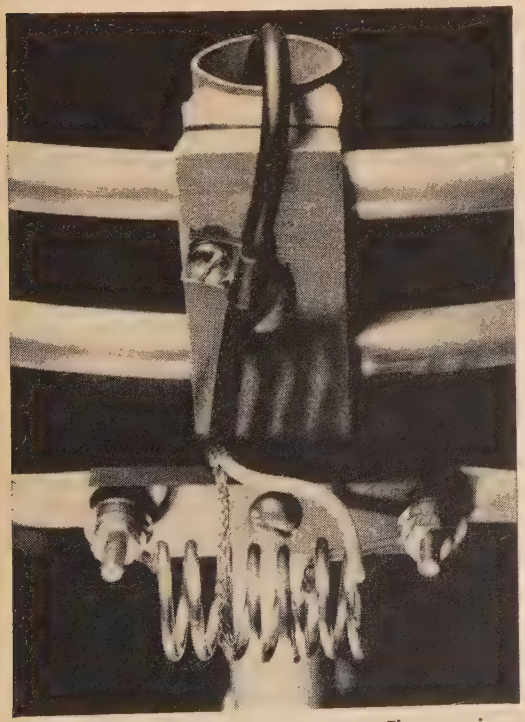


Fig. 1—Construction details of the matching transformer. Further details are given in the text.

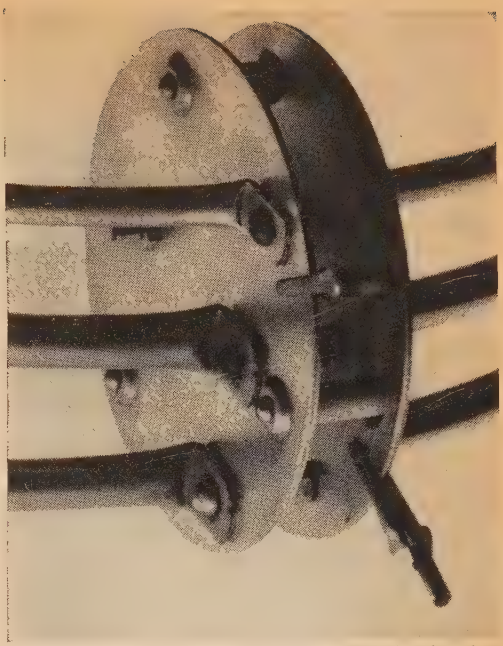
times! Even more important in a mobile installation it increases your receiving ability by that much too. Since using this coil the past year we have worked 26 states, South America, and Mexico. It has been used by many hams we've shown it to and they all report amazing results. You can build this coil in less time than it takes to read this article and it will cost you less than the price of a hamburger.

Facts About Your Halo

We might point out at this time that the halo is a very sharply tuned antenna and falls off rapidly on either side of its resonant point. To help overcome this I have tuned my halo to 50.4 *mc* and peaked my converter to 50.1 *mc*. This helps to flatten out the response over the



Location of the coil on the antenna. The coax is brought up through the mast and down to the terminals.



The capacity adjustment in the halo is critical and not easily changed when you just want to QSY a few kilocycles. Here's a way you can keep the halo tuned exactly to frequency easily. Place the 2 alligator clips on the halo about as shown and adjust for minimum SWR the center adjustment between the plates. You can adjust for maximum field strength if you prefer. Now if you move the clips so they are across from each other you will be about 50.05 mc and if you move them further apart so the one on the left is straight up you will be set at about 50.6 mc. On a band opening I just remove the one on the left and am automatically tuned up to about 50.85 mc. This is a good place for a mobile during the openings when the lower portion of the band is so crowded.

lower portion of the band. When it rains or is very damp outdoors the halo's resonant frequency drops considerably—sometimes to as low as 50 *mc* when it is tuned to 50.4 *mc*. The rain and moisture have very little effect on the auto-coil. The resonant frequency of the antenna changes due to the dielectric change in the capacity plates of the halo. We use the sensitivity of these plates to advantage in a tricky way of tuning the halo to whatever frequency we wish to use without changing the critical tuning adjustment within the halo plates. (See photo of halo plates and caption with photo).

Let's Make An Auto-Coil

Wind a coil of 5 turns of #8 or #10 copper wire on a ⅝ inch form as shown for coil "A". (Refer to diagram). Make the ends of proper length and spacing to fasten on the halo terminals. Wind another coil of about 3 or 4 turns of the same kind of wire and diameter as shown in "B". Now push coil "A" against coil "B" and

[*Continued on page 119*]

Full Size Three Elements On 40

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R. D. 3, (White Hall)
Danville, Pennsylvania

The tower and beam at W3KRQ. The size of the beam can be pictured by comparing it to AL on the tower.

"I didn't believe it when I heard it. And now that I've seen it I still can't believe it." That was the comment of an amateur who recently came to pay me a visit. The amateur from Indiana was at my home to view my new home-brew full-size Forty-Meter Three-Element Rotary Beam. Thought to be the largest of its type in use today, the beam is forty feet long and nearly seventy feet wide mounted on a seventy-foot tower.

I have had so many questions directed to me on the air about it, that I thought I would try to put it in writing. Always using beams of Plumber's Delight construction on 20, 15, and 10 meters in my past 15 years as a ham and knowing how well they worked, set me to thinking. Why not one on 40 meters?

One evening I figured the length the elements would have to be, the length of the boom for .15 spacing, and all the material and hardware I would need. Man, what a challenge this would be! What kind of material would I make this monster from? Not too heavy, but strong—strong enough to withstand the frequent ice storms at my QTH—strong enough to weather a hurricane that might pass by.

Locating Material

So I started looking for the material. I drove to Dick's, W8IJL, Tiffin, Ohio, for I knew Dick had plenty of tubing on hand. I wanted to try different sizes and weights together in the length the longest element would be. I wanted to see how much a seventy foot element would sag, and to get an idea of the torque to expect. After many trials of different sizes and materials and several hours later, I selected the tubing I thought best for the job. The elements would contain twelve-foot lengths of Alcoa 6061T6 Aluminum. The wall of the aluminum was .058 with varying diameters of 1⅞, 1¾, 1⅝, 1½, and 1⅜.

The boom would be made of two 20-foot lengths of four-inch irrigation tubing. (Available at *Sears Roebuck & Company Stores.)*

All clamps to hold the telescoped elements were stainless steel hose clamps—the type plumbers use. The clamps to hold the elements to the boom were muffler clamps, which are available at auto parts stores.

After several days of getting parts, I started construction.

Construction

The two sections of 20′ by 4″ irrigation tubing were joined by a six-foot piece of laminated oak wood turned down in size to fit the inside of the irrigation tubing. It was pushed three feet inside the pipe after it had been treated with wood filler and several coats of aluminum paint. Also at each end of the boom, three-inch plugs were shoved into the boom where the clamps would grip. This was done so the tubing would not collapse under the pressure of the clamps.

As you can see by the pictures, there are adapter plates between the element and boom. Their purpose was to keep the muffler clamps on the boom and elements some distance apart.

The plates are 20" by 24" by 3/16". This permits the four-inch clamps to be placed 18 inches apart on the boom. On top of the plate, they are 22 inches apart on the elements.

Precautions

Certain precautions must be taken if you wish your beam to last a good many years. We did the following things: All steel muffler clamps were cooked in a 30 per cent solution of Muratic Acid until clean. I then coated each piece with Zinc Chromate and several coats of Aluminum Paint. Before installing the clamps, we wrapped the aluminum boom and elements with a stainless steel band at the points of contact with the muffler clamps. (This is the same kind of band that is used to mount television antennas on chimneys.) This band kept the steel muffler clamps from cutting into the softer aluminum. The stainless steel band is also a good bond between the steel clamp and aluminum in holding down electrolysis.

The elements were made up so I would have double strength most of the way out from the boom. (Fig. 1) One end on each piece, except

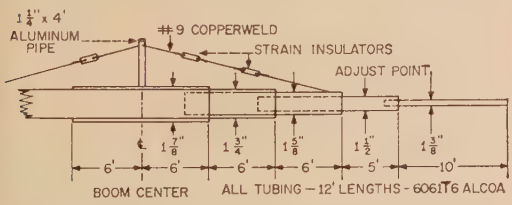


Fig. 1—Element makeup. Telescoping elements increase structural strength as explained in the text.

the last, was slotted with a hack saw. All telescoping parts were coated with Penetok A. (Distributed by General Electric Supply Company.)

We started with the center piece, a 1⅞, then a 1¾ telescoped in six feet. Next, a 1⅝ was telescoped in six feet. Then a 1½ telescoped in approximately seven feet. This is the point I used to resonate the element to the desired frequency. The 1⅜ piece telescoped in about two feet as this is a light and strong section.

Stress Wires

With this type assembly the element had approximately 42 inches of sag. This was not bad for an element of over 69 feet in length. But I did not think this was good enough, for winter ice and snow clinging to it would lower it even further.

As the illustrations show, stress wires were placed on each element. This was done with *No. 9 Copperweld Clothesline*, which was broken up with stretch insulators (fig. 2). The wire ran from a point 18 feet out an element, to the top of a 4' by 1¼" aluminum pipe standing vertically in the center of the element, to a point 18 feet out the other side of the element. These vertical pieces were clamped to the center of the element, and the sides of the vertical pieces were braced to the mounting plate. Three of these are all that are required, because the center one takes care of the boom, as well as the center element. This same kind of stress wires were used on the side of the boom as an added precaution.

The boom strength was tested by two men, each weighing nearly 200 pounds, sitting on the ends like you would on a teeter-totter. The elements' strength is such that these same two men hung by their hands 20 feet out each side from the boom. I am confident that this beam could carry still more weight.

Testing

The entire beam was then assembled on a tripod 15 feet above the ground for the purpose of experimenting with the tuning and matching. We checked the operation of the beam (1) with no wires, (2) with solid stress wires, and (3) with wires broken up with insulators.

With no stress wires at all, the beam res-

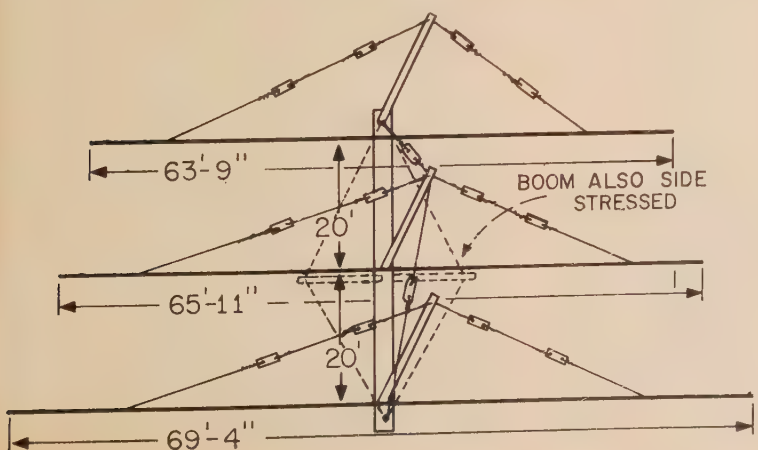
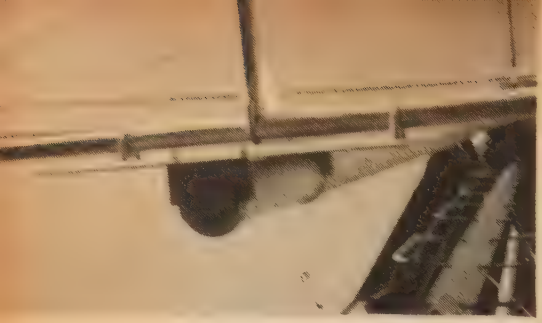


Fig. 2—Overall view and dimensions of the 40 meter three element beam.



How the elements are mounted on the boom. The stress wires and vertical posts can also be seen.

Center section. Side stress wires and posts can be seen as well as the verticals.

onated at 7150 *kc*. I wanted to have it resonate at this spot, because I knew it would resonate higher in frequency when it was lifted to the seventy foot height. Later, I found that to be an increase of 100 *kc*.

Next, I installed solid stress wires (no insulators). Again checking, we found the beam had shifted to almost 7800 *kc*. How it would work here could be anyone's guess. Anyway, I didn't intend to find out.

I then broke up the stress wires with insulators—two each on the director and reflector and four on the driven element. Checking again, we found the resonant point to be the same as without the wires.

Mounting Head

The mounting head for the mast is a tilting head. A 3' by 5" piece of channel iron was centered and welded on top of the 2½ inch water pipe mast. Two braces 1½" by ¼" were welded between the sides of the mast and the ends of the channel iron. (Fig. 3) Another identical piece of channel iron was placed on top of this. On each outside corner, ½" by 4" strap steel was welded to the bottom piece of channel. The remainder of these pieces reach up past the sides of the top piece of channel.

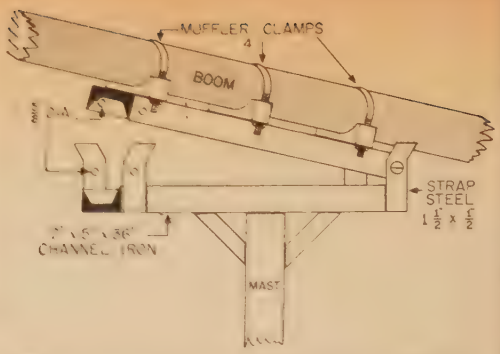


Fig. 3—Methods of adapting the boom to a tilthead mast. All joints are securely welded.

With two pieces of channel in this position, holes ⅝" in diameter were drilled through the straps at a point where they would go through the sides of the top piece of channel iron, and ⅝" by ½" bolts were inserted. When one bolt is removed, the top section of channel can be made to tilt in a vertical position. The top section of the tilt head is secured to the boom by the use of four inch muffler clamps. The clamp nuts went on the inside of the channel. The bottom section of channel and mast were installed atop the tower.

Mounting

You probably are wondering how we got this monster up a seventy foot tower. The tower (Aermotor) has accommodations at the top to mount a Gin Pole. The beam was installed with the use of a pulley and rope.

With a man on top the tower with two ⅝" by 5½" bolts and a couple of wrenches, we were ready to start. The boom, equipped with mounting plates, stress wires, and tilt head (upper portion), was the first to go up. A man on the ground pulled it up with the rope, while the man at the top guided it to place. The two ⅝" bolts were installed, and the boom was completed. The driven element equipped with the Omega Box, Gamma Rod, and stress wires was next to go.

Then one tilt head bolt was removed and the boom tilted in a vertical position. Twenty feet down the tower the director element was installed. The beam was then returned to a horizontal position, and the tilt head bolt replaced. The other bolt was then removed and the boom was tilted vertically again in the reverse direction. Here the reflector was installed.

Feed

The Omega match as used on this beam (see drawing) is a modified Gamma match. The matching rod is made shorter and impedance adjustment is made by adjusting a small condenser rather than the rod length. This is a point of high impedance and a small variable

[*Continued on page 118*]

The Ultimate Anchor

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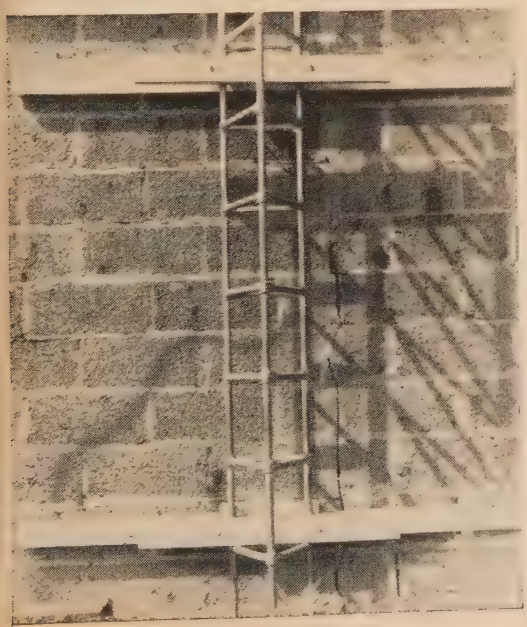
There comes a time in the orderly evolution of each ham who operates on the higher frequencies when the shadow of suspicion becomes a cold, rock-hard fact; if you can't beat 'em, join 'em—GET A ROTARY BEAM! Whether we build, buy, or borrow them, we eventually wind up with a beautiful collection of gleaming metal rods, a powerful package of rotator, and graceful coils of coax and control cable.

The next problem (all the time problems—this is supposed to be a hobby?) in the order of things is where to mount it so it will give us the most benefit. Mounting it on the roof was rejected because of vehement protests of the XYL and the known fact that the metal and wiring in a house does terrible things to an *rf* field. It is finally decided that nothing but a tower will provide the answer. It must be as inconspicuous as possible, so we must put it in the back yard. It must not have any guy wires, so that we don't hazard the possibility of decapitating any of the neighborhood children (ours included, adds the XYL). It must be very solidly anchored so those very masculine storms with the delicate feminine handles won't deposit it in a nearby attic.

The expense of mounting the triangular, climbable, free-standing tower, which the author acquired, in several yards of seemingly gold plated concrete dissolved when his feverish eyes settled on the cinder block garage. It was solid, it had a very wide base, it gave at least six feet of vertical leverage, and best of all; it was already in place—the *ultimate anchor!*



Installation

So much for the preceding verbose drivel, let's get to the hammer and saw stage. First we select two cinder (or cement) blocks in the second course of blocks from the bottom and the same in the second course of blocks from the top and drill holes through the air space portion so that they will straddle the outside dimension of the tower legs. Now we can assemble the following materials—

4—2"x4"x6' lumber for support member.
2—2"x4"x3' lumber for clamping member.
2—2"x4"x14" lumber for spacer.
4—⅝"x2' threaded steel rod.
6—⅝"nuts and appropriate sized washers.
3—ground clamps
3—1"x24" woven copper battery straps
3—6' ground rods.

Drill a ¾" hole in each of the six supporting and clamping members so that they line up with the holes drilled previously through the blocks, and then give all the pieces of lumber at least two coats of paint. Put the rods through the drilled holes and cinch them up tight to the wall with the long end of the rod on the weather side of the wall. The reason for the seemingly unnecessary length of the support

[*Continued on page 117*]

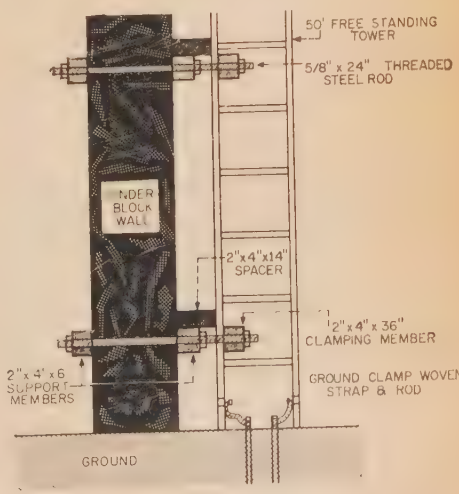


Fig. 1—Cross section view of the tower support.

Vertical Antenna Design In Theory And Practice

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Most of the material in the literature relating to vertical antennas covers the design for either single frequency antennas (i.e. broadcast use) or for very short antennas for mobile use. Neither of these approaches is particularly useful for the amateur who wants to use a vertical antenna on various frequencies either because he is interested in experimenting or because he has space problems. This is written to give practical solutions to such amateurs and is broken into several steps so that they can use any or all of the steps, depending on their particular cases.

Elementary Theory

Some elementary theory must be considered at the start so that we are all thinking along the same lines. In the usual applications, vertical antennas are operated against ground and the ground system forms part of the radiating system. Note that this is true whether the antenna is shorter than a quarter wave, equal to a quarter wave or is longer than a quarter wave. This means that consideration must be given to the ground system in the vicinity of the antenna for proper operation. Further, as a matter of convenience in adjusting, tuning and feeding power, it is customary to feed the antenna at the ground end with coax line.

Let us consider the simplest case, a quarter wave antenna, with an appropriate feed system, and then we will go into variations that are more complex or involved. Because this is the case usually described, we will cover it fairly quickly. If the antenna is resonant at the desired frequency we have a purely resistive load, and the problem is simply one of matching the antenna resistance to the feed line. Obviously, this requires that we know both the antenna resistance and the feedline resistance (or surge impedance as it is sometimes called). If we use coax as the feedline, we know that the resistance is determined by its construction and is constant and fixed; we cannot change it. On the other hand, the antenna resistance can vary considerably from one antenna to another even though the antenna is in each case resonant. Let us review how this comes about.

Resistances

The *total* antenna resistance is composed of several parts, namely, ohmic, radiation and ground components. The ohmic or *rf* resistance can be made negligible by using reasonable size wire. The ground resistance is the part we know least about. It depends on the characteristics of the soil and the connection we make to it. We can't change the soil unless we want to go into extensive chemical treatment but we can vary the connection we make to it.

There are two principal approaches; the first is to drive as many long copper plated rods as we can and then bond them together to make the ground connection. In practice, this may vary from one rod (a most indifferent ground) to as many as a dozen or more. Regarding the length of the rods, many tests have been carried out by engineering companies which show that anything less than six feet depth is a total waste of time. About eight feet is the least depth for satisfactory results. At *least* four should be used and preferably six or more. This will result in a satisfactory ground connection if they are well spaced at least an eighth wave away from the base of the antenna, and well bonded together with large size wire or strap, and will result in reducing the ground resistance component of *total* resistance to a very small fraction.

The second way of reducing ground resistance to the minimum is to provide a network of wires covering as large an area as possible, close to or on the ground. These wires should be well spaced from each other and run as far as possible in all directions from the base of the antenna. They provide a large capacity to actual ground so that the capacitive reactance is very, very small. Again, in actual practice, very few of us have the space or wire (or ambition) to run the classic 32 radials a quarter wave from the base of the antenna. A compromise solution is to provide a large close-spaced grid immediately in the vicinity of the antenna base, supplemented by as many and as long radials as space permits.

It goes without saying that a combination of both the rod system and the wire grid system can be used to good advantage. Remember one thing, the antenna will work with even only one radial or ground rod, but you will be wasting power which is being dissipated in the ground resistance instead of being radiated. You can start with the minimum if you must get on the air promptly, and add to the ground system from time to time without affecting your match

or loading appreciably, but don't blame poor performance on the "vertical" which is actually due to a poor ground system.

The remaining component of *total* resistance is the radiation resistance, that *fictitious* resistance whose value is equal to one that would dissipate the amount of power that leaves the system as radiation. This component we cannot change except by making the others as small as possible in relation to it so that as much of the total power as possible is represented in "radiation resistance."

Measurements

Now, regardless of the type of ground system you have provided, the *total* antenna resistance must be *measured* in order to calculate the matching network to be used between the antenna and the feedline. Forget about the classic 36 ohm figure which is theoretical and rarely met in practice. Acquire, by fair means or foul, an antenna bridge and measure the antenna resistance at its resonant frequency. The bridge may be quite simple in form and the construction of many types has been described in the *Handbook, CQ* and *QST*.

Knowing the antenna and feedline resistances, refer either to the standard engineering textbooks if you are familiar with them, or read thoroughly George Grammer's article in March 1957 *QST* on the design of "L" networks. Nothing more complicated than a small amount of simple arithmetic is involved in determining the sizes of a small coil and a condenser to be connected between the antenna and feedline to achieve a perfect one-to-one match. To eliminate the "cut and try" aspect, series feed is recommended, that is, the feedline is connected through the "L" net to the antenna and the coax shield is connected to ground, rather than parallel feeding the antenna.

Now let us consider some of the variations on the simple, large, grounded, resonant quarter wave vertical discussed above and then we can take a specific example and work out an actual case that can be used as a guide for almost any other case.

Variation 1. The ground plane antenna.

This name is usually applied to a resonant quarter wave vertical for *vhf* use, where the radiator is physically small and is raised well above the actual earth ground, and an artificial ground is established at the base of the radiator to produce the standard radiation field pattern. The artificial ground may take the form of a large screen, or more commonly, four horizontal quarter wave radials. In a similar manner, an antenna for *hf* use may be erected on a structure well above the earth and the artificial ground plane provided by wire radials.

The feedline matching problem may be handled in exactly the same manner as that for the vertical antenna whose base is actually at ground level. There is one additional trick sometimes employed with the elevated antenna where a narrow band of frequencies is to be covered, and that is to slope the radials downward from the antenna base and thereby raise the feedpoint resistance sufficiently to provide a good match to a 52 ohm coax line without the use of an "L" network. This approach is based on the assumptions that the radials are each a quarter wave long and that the feedpoint resistance varies from approximately 36 ohms when the radials are horizontal to 72 ohms when the radials are vertical, that is, when they hang straight down from the base of the radiator. Hence, there should be some intermediate position or angle where the feedpoint impedance goes through 52 ohms value.

Variation 2. Vertical antenna shorter than a quarter wave.

Any length of radiator which is less than a quarter wave can be made resonant by adding an inductance in series. The straight, short radiator which has a length electrically less than a quarter wave at a certain frequency will have a capacitive reactance at that frequency which must be compensated for by adding an equal inductive reactance, and the inductance necessary to produce it may be lumped in one place, in several places or distributed throughout the length of the radiator. The important thing to keep in mind is that in adding the inductance we must be careful to add the minimum resistance with it, otherwise we are just adding a power dissipating, non-radiating load to our transmitter. This high L, low R means a high Q coil. One of the unavoidable results of the high Q coil is that the antenna will operate over only a narrow band of frequencies without retuning. Compare, for example, the mobile antenna for 160 or 80 meters which is an extreme case of narrow band operation.

To digress for a moment, the broadcast antenna engineer has a tower which is practically never the proper length for the frequency at which it is intended to operate. Since he will operate it at a *single* frequency, he designs a matching network which combines both the loading characteristic and the impedance matching constants. This requires accurate impedance measuring equipment and engineering knowledge. For the amateur purposes, it is easier to divide the problem into two parts, first to provide the loading to produce resonance and second to determine the matching constants. If resonance is first achieved then all that is required is to measure the resistance component of the antenna and this may be done by rather simple equipment, as previously mentioned.

The most satisfactory and accurate method of measuring the resonant frequency from the viewpoint of the amateur is to connect a loading coil between the antenna and ground, and by means of a grid-dip meter get the indicated resonant frequencies for several tapped positions on the coil. Then on a piece of graph paper, plot the frequency readings versus uniform spaced tap positions. This averages out errors in read-

ings and also gives information of the tap positions required over a considerable range of frequencies. Then pick the mean or mid-frequency at which you will operate, set the coil tap, and by means of the resistance bridge, *measure* the total antenna resistance.

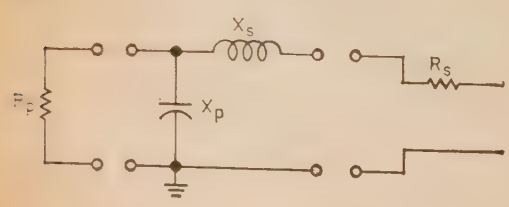
This R value is then used in the formulas to design the "L" net, "a la Grammer." The matching network is satisfactory over a considerable range of frequencies provided the antenna resonance is re-established for large changes, and as a case in point I will give a specific example.

Bear in mind that the values I give are actual for my case and not necessarily correct for other places or cases although they are generally indicative of what may be expected. The radiator is a 40 foot steel antenna mast, tapering from two inches diameter at the bottom to one and a quarter inch at the top. It is guyed at mid-height and the top by three guys. The base is a six inch pillar insulator resting on a concrete slab on the ground. The radiator is base loaded with a coil of 20 turns, 3 inches in diameter and five inches long made of one-eighth inch copper tubing. This coil is tapped to resonate at 3295 (MARS frequency), 3600 and 3900 *kc*. A single "L" network designed to match the antenna R at 3600 *kc* is used. With the proper tap position set on the loading coil, the reflected power indicated is not over one per cent at the MARS frequency or anywhere in the 80 meter amateur band. The measured antenna resistance varied from 20 ohms at 3295 *kc* to 28 ohms at 3900 *kc*.

Variation 3. Vertical antenna longer than a quarter wave.

In this case the antenna has an inductive reactance which must be cancelled out by a series capacity to achieve resonance. Going back to the method in variation 2, we proceed in exactly the same manner and measure the resonant frequencies via a grid-dip meter and adjust the series condenser to obtain a series of resonant frequencies for various settings of the capacitor covering the extremes of the band we want to use. Then we pick a median frequency, set the condenser for that and measure the total antenna resistance.

Now let us take a specific example of the calculation of an "L" network to match an antenna of measured *total* resistance to a feedline of known resistance (or surge impedance). For our purpose, we will pass over the derivations of the formulas which may be derived from Thevenin's Theorem in the standard texts, or you may refer to the article by George Grammer for the theory in simple form. Consider the circuit below:



The larger of the resistances is always put in the parallel arm and is called R_p. The condenser which is in the parallel connection is called X_p. The smaller of the resistances is always put in the series arm and is called R_s. The inductance in series with it is called X_s. The formulas we will use are as follows:

$$Q = \sqrt{\frac{R_p}{R_s} - 1} \quad (1)$$

$$X_s = QR_s \quad (2)$$

$$X_p = \frac{R_p}{Q} \quad (3)$$

Let us take a specific case and put in some reasonable numbers for calculation purposes. Assume a resonant quarter wave antenna for 3600 *kc* whose resistance we have measured as 28 ohms. Assume further that we want to match it to a 52 ohm coax line. R_p always represents the larger of the two resistances, in this case 52 ohms. R_s then, represents the antenna resistance, 28 ohms. Using formula (1) we solve for Q and get $Q = 0.927$. Then from formula (2) X_s will be 25.9 ohms, and from (3) X_p will be 56.1 ohms. Then convert these reactances to actual values of inductance and capacity from the following formulas.

$$C = 0.159 \frac{X_s}{f} \qquad C = \frac{159{,}000}{f\ X_p}$$

WHERE L IS IN MICROHENRIES
C IS IN MICROMICROFARADS
X IS IN OHMS
F IS IN MEGACYCLES

We find L equals 1.144 microhenries, C equals 788 mmf. The coax which is represented by R_p is connected across the 788 mmf capacitor and the antenna which is represented by R_s is connected in series with the coil. Now at the risk of insulting your intelligence, let me repeat, the large resistance is the *coax* in this case, and is the parallel arm, the smaller resistance is the *antenna* and is the series arm. *You do not* put in any other resistances. And if you have gone this far to get a matching network, go the whole way and check the coil you make with the aid of your grid-dip meter and a one or two percent tolerance condenser. One of the major elements of satisfaction in engineering a job this way lies in the fact you can put it in your antenna system with complete assurance that it is correct and requires no "peaking up."

You have probably noted that we worked with a resonant antenna without considering whether there was a series coil or condenser. If there was a series antenna coil involved for resonance, the network coil could be part of the antenna coil since they are directly connected together.

Now what about the case where the antenna resistance, as measured, is greater than the feed-

[*Continued on page 116*]

Antenna Tracks

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Joe Jennings, W6EI and I were discussing his installation for working on his beam. I felt sure a great many hams would be as interested as I was, because it is workable no matter how high the pole. Also, the shorter the pole the less money for track. But to return to our conversation, I asked Jo if he had designed and installed the mechanism. His reply I think is surely worth repeating, and I quote:

"First, I felt that I was infinitely unqualified to climb the 100 foot stick used to support my beam. Second, JAT was not always available to work this backyard highline, so third, which follows, was inevitable.

I handed our plant engineer a high fast one. I told him what I wanted was a neat, fairly economical, dependable mechanism which could be used to raise and lower the beam when it needed work. I was sure when I gave him this package, that his background in lifting heavy equipment would give him the answer.

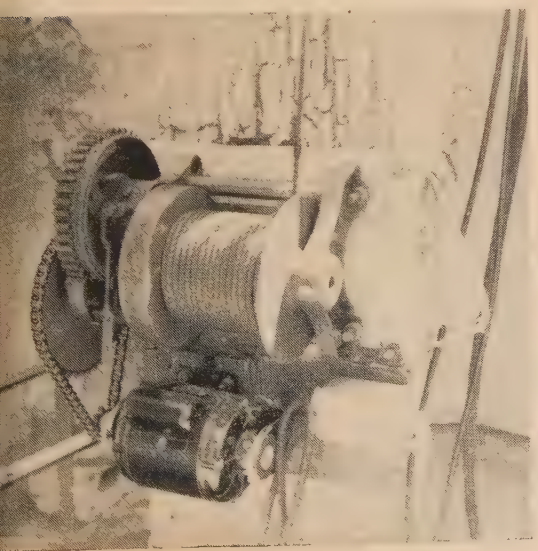
What he had to move up and down the 96 feet of pole was a 6 element two-band Telrex with rotor. He approached and solved the problem in this manner. Using a type of track readily available (1½ x ½ power strut), it was mounted on the pole using a strap and bar arrangement at the top and bottom. The straps go around the pole with the bars secured to them and the track to the bars. The other cross ties are lag bolted to the pole and welded to the rail.

Next, a small carriage was constructed to fit (1) beneath the rotor, and (2) support the beam in two places. The first of these supports three feet above the rotor and the second directly below the beam. The carriage shown in photo rides the tracks. A cable was then attached to the trolley, run up over the peak of pole via a pulley and then down the other side to the winch. A single control at the winch raises and lowers the beam. It's that simple.

It is really a terrific mechanism and has worked for some time now without a hitch."

If there are any specific questions on detail, drop me a note at Jennings Radio and I will be very happy to get the information to you. ■

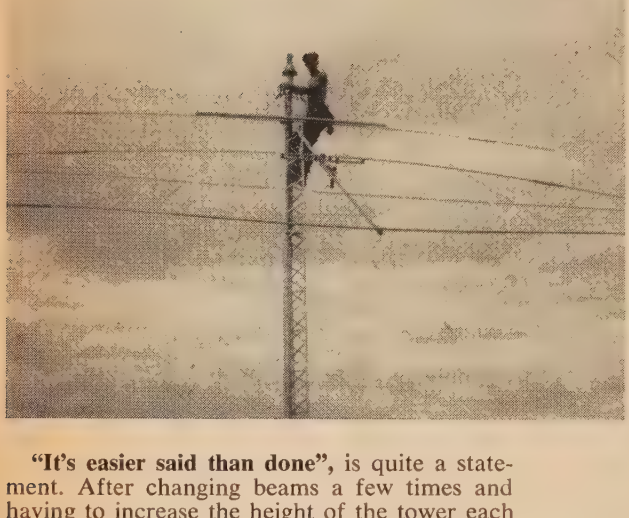
Winch assembly used to raise and lower the beam with a line passed over a pulley on the peak of the 100 foot pole.



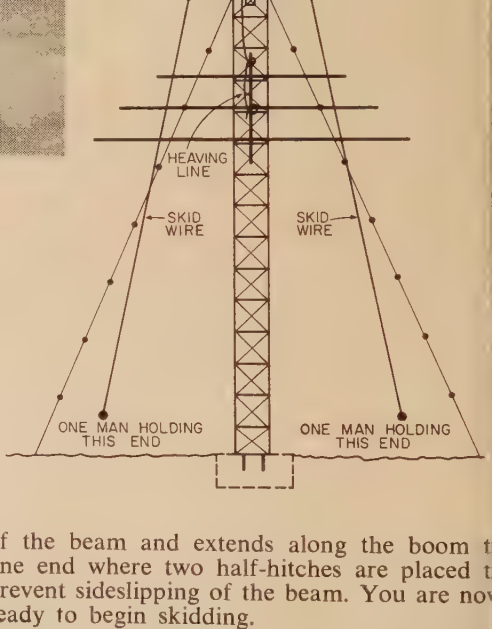
Carriage supports the rotor. The beam mast is secured at two points but only one is shown in the photo. The carriage then rides the tracks up pole.

Raise or Lower Your Beam in Five Minutes

"By Skidding or Sliding Your Beam Up a Pair of Wires, You can save Your Back—And Get the Job Done—QUICK!



Wade H. Williams, K5ILG
2327 Wheeling Ave.
El Paso, Texas



"It's easier said than done", is quite a statement. After changing beams a few times and having to increase the height of the tower each time, I decided there must be an easy way. It requires a considerable amount of work with a Gin Pole, block and tackle, or what have you to lower a tower in excess of 24 feet when the beam and rotator are attached. Why not place the tower in a upright position, adjust the guys and turnbuckles to the proper tension, clamp on your safety belt and climb to the top to prepare for skidding up the beam with the greatest of ease?

My system makes use of a piece of 2" aluminum channel about 6 feet long as a spreader. Drill a hole in the center and at each end of this spreader. Any piece of pipe will do, but be certain it is sufficiently strong so as not to bend under the strain. DO NOT USE a stick or board smaller than 2 x 4 in size as the tendency for breakage increase is universely proportional to the board size. At each end of the spreader secure a piece of 16-6 stranded clothes line a little longer than the tower is high. A heavier piece of wire about two feet long is secured in the center hole.

The "Hoister" (colloquial term for courageous amateur aerialist) climbs to the top with his safety belt and heaving line, one end of which is fastened to the tower. The spreader is then hauled up by use of the heaving line and the center wire on the spreader securely fastened to the pipe which mounts the rotator. Now drop the heaving line again and haul the rotator up to the top. Fasten it to the pipe and you're ready for the beam.

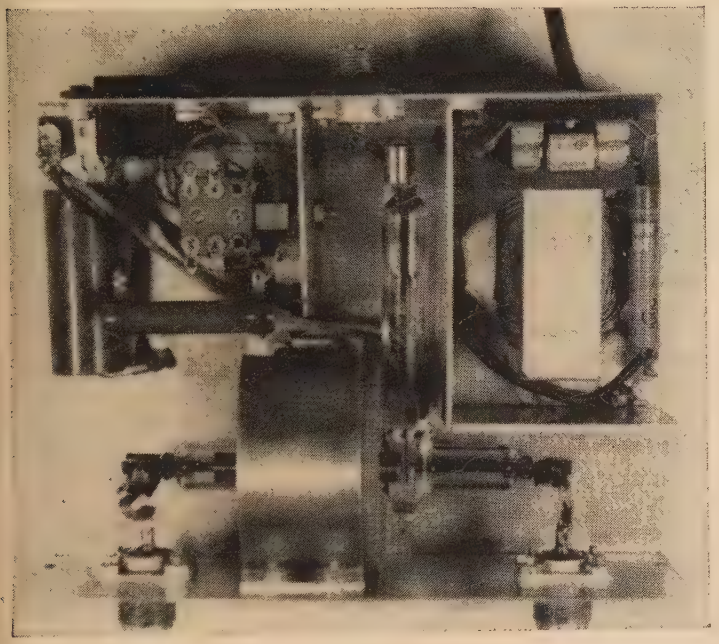
The heaving line is then tied to the center of the beam and extends along the boom t one end where two half-hitches are placed t prevent sideslipping of the beam. You are no ready to begin skidding.

Each end of the number 16 wire is tightl held by a man on the ground while th "Hoister" pulls the beam skyward as it slide smoothly over the skid wires. There is n strain, very little weight and by employin the safety belt, both hands are free to set th beam onto the rotator. As the end of the bea passes, be sure to unfasten the half-hitch o the end of the boom. The ground men are no reprieved and ready for the 807's.

It has been suggested that the beam b skidded over the tower guy wires. Don't try it The insulators serve as excellent stumblin blocks and in trying to free the elements, dam age may result. The beam used here is Mosley Tri-Bander. The method can, however be applied to the largest of arrays.

The "High man on the Totem Pole" in th picture is Ed Roberts K7GAM/5. ■

A Vacuum Coaxial Antenna Relay



James Resler, W8EVZ
5432 Laura Lane
Norwood 12, Ohio

The relay to be described will be of particular interest to the SSB enthusiast. While many fine articles on TR switches have been written the relay type antenna switch has taken a back seat, mainly due to arcing with its associate contact wear, noise, and inability to follow voice control operation. The vacuum switch overcomes all these disadvantages with several added "plus" features. To build a case for the vacuum relay we can begin by saying 1. It will handle the maximum peak powers encountered in SSB operation without arcing 2. It has negligible insertion loss to well above 30 *mc* 3. Contact wear is practically nil 4. It is very fast acting and 5. It is quiet.

The heart of the unit is an Eimac VS-6 vacuum switch, which is available with a 12 or 24 *vdc* coil. The entire unit is housed in a Bud minibox. A small DPDT relay was included for receiver and final amplifier control but may be deleted if already available in the transmitter. The parts layout while not critical has been laid out for maximum symmetry.

Operation

The unit has performed admirably for some time with voice control SSB operation. A monomatch which is connected permanently in the line shows no detectable difference with the relay in or out of the line on Ten meters. The unit could be very easily built right in that new final you have in mind, or as is provides a compact self powered unit ready to go in the line for long trouble free operation. ■

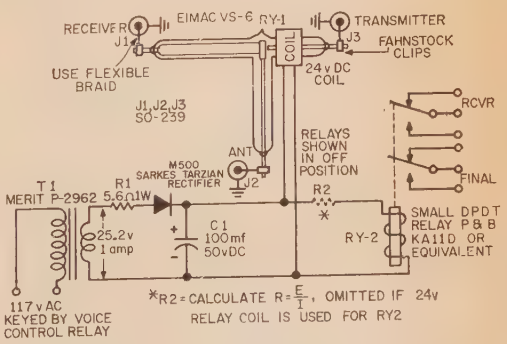


Fig. 1—Vacuum coaxial antenna relay circuit. The relay is available with a 12 or 24 vdc coil.

CQ Reviews the HT-37

Adolph Suchy, W2KHE

Many phase shift networks and filters have gone under the bridge since W1JED and W2UNJ first described single sideband generators some nine or ten years ago. The relative merits of "filter vs. phasing" has been a topic of discussion on the sideband frequencies ever since, and many of these discussions have waxed a bit on the warm side. However, it was always generally agreed that, while the filter method gave better suppression of the unwanted sideband, the phasing rig sounded much more natural and was pleasant to copy. Some of the devotees of the phasing side of the controversy built their rigs with scrupulous care and came up with not only good audio quality, but superb sideband suppression as well. This proved their point but—and here was the stumbling block—the equipment and know-how necessary, and the care and time consumed in adjustment was a bit beyond the average ham's ken. So, as a result, most of the quality rigs up to about six months ago contained either crystal or magnetoscriction filters or various frequencies.

Because of this, many hams looked upon the new phasing rigs with the discerning eyes of a Missouri Senator and were a bit dubious as to the signal quality of these rigs. However, news spread like wildfire and no sooner had the HT-37 put in an appearance on the ham bands than its praises began to be sung. Yes, the HT-37 is a phasing rig and one whose performance is not second to any of the existing rigs on the market.

Looking at the schematic diagram of the sideband generator reveals nothing unusual about the circuitry which gives this superb performance. One would expect some trick circuits, some unusual components etc., to attain the excellent suppression of which the HT-37 produces. The audio section seems to be a lea from the notebook of designers of the past Circuits tried and true seem to be the answer However, the secret of the success of the HT-37 seems to be in the audio and *rf* phase shift net works. The sealed phase shift audio network Z is a "little black box" which obviously is a passive type of network whose theory of operation can be studied in Don Stoner's *New Sideband Handbook*. The secret of success here seems to be the choice of components for this network Together with the audio, the *rf* phase shift network shown in fig. 1, again reveals tried and true circuitry with extreme care in selection of components. The bridge type of *rf* phase shift network is also described by Don Stoner and makes interesting reading for a stay-at-home evening.

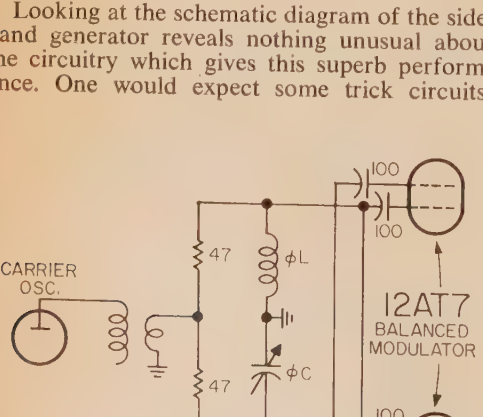
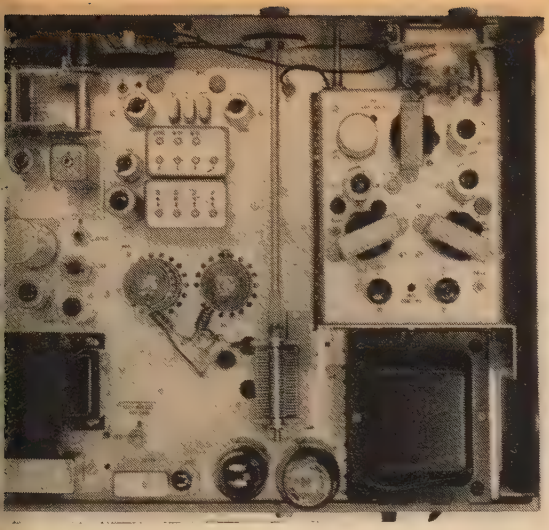


Fig. 1—Bridge type rf phase shift network.

Control Functions

Now to the complete picture. In outward appearance and size, the HT-37 resembles the HT-32 very closely. As a matter of fact, upon lifting the cover and comparing them, the chassis seem to be made from the same dies. Placement of tubes, tube types and even circuits are so similar as to make these two types of Hallicrafters gear almost twins. The cabinet of the 37 has been changed a bit with its recessed panel and excellent gray finish to make it compare with the more modern look of the latest type of ham gear. A large, easy reading dial is on the left which makes bifocals unnecessary and even the knobs have gone modern. The bandswitch knob is so constructed as to make it almost impossible to make a mistake as to which band the transmitter is set and the final tuning knob has a dial which is visible through a port just above it. This dial indicates the setting of the final plate capacitor for each band for correct tuning. The rest of the panel adjustments include the two carrier null pots, audio gain control, function switch, (OFF, CALIBRATE MOX, VOX and STANDBY positions), the mode switch, which selects UPPER or LOWER SIDE BAND DOUBLE SIDEBAND and CW, an *rf* level control which effectively reduces or increases the output in the DSB and CW positions and a knob for running the driver stage. In the CALIBRATE position, the signal output is controlled by the calibrate knob. The panel is completed by a mike connector, a key jack and RF LEVEL output indicator.



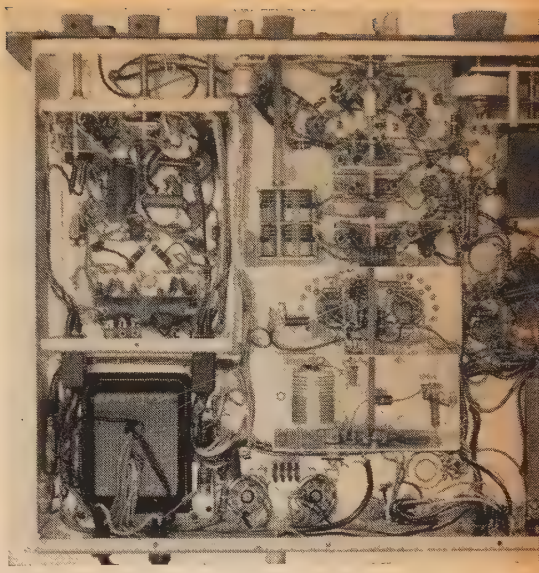


Fig. 2A—Top and bottom view of the HT-37.

Inside the Cabinet

Now for a squint inside the cabinet and a bit about the workings. Figure 2A shows the top view of the chassis. Note the accessibility of all the adjustment from the top side of the chassis. Should alignment be necessary, all of the adjustments can be made without turning the chassis on its side or upside down. The sideband generator appears on the left as a complete unit. The final amplifier with its pair of 6146's occupies the center portion of the chassis together with the mixing circuits. On the right hand side of the chassis from front to rear one sees the *vfo* on a sub chassis, the vox circuits and some of the power supply components. The bottom view, fig. 2B reveals some interesting details. On the left front is visible the loaded dial mechanism for the *vfo* which is very smooth in operation. Note the shielding in the *rf* portion of the rig. This is the answer to the stable operation of all circuits. After twenty hours of operation no trace of instability could be found anywhere, either in the *af* or *rf* portions of the transmitter. Also, note the husky power supply components which, in spite of only convection cooling remained as cool as the proverbial cucumber.

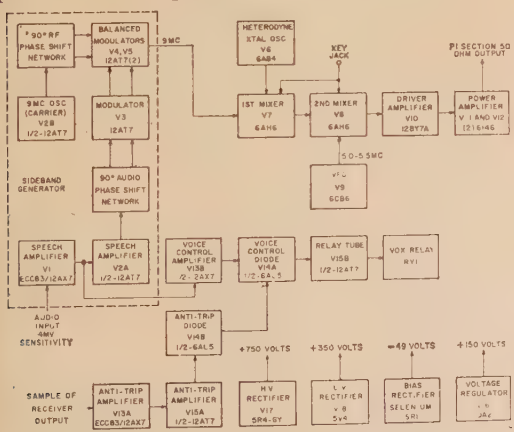


Fig. 3A—Block diagram of the HT-37.

Operation

Now to the operation of the rig. Figure 3 shows the block diagram of the transmitter together with the frequencies developed in the various heterodyning and mixing stages. The sideband signal is developed at 9 *mc* by a crystal oscillator. This sideband signal is then beat against a heterodyne crystal oscillator so that the resulting frequency can be mixed with the *vfo* (5.0-5.5 *mc*) to place the driver and final on the amateur frequencies. So much for the general picture. Now to specifics. As was already mentioned, the *vfo* tunes from 5.0-5.5 *mc*. This oscillator is of the Colpitts variety, well

OUTPUT FREQUENCY DEVELOPEMENT							
BAND	1ST MIXER, V7			2ND MIXER, V8			BAND
	INPUT		OUTPUT	INPUT		OUTPUT	
	FROM SB GEN.	FROM HET. OSC		FROM 1ST MIXER	FROM VFO		
80M	9.0MC	INOPERATIVE	9.0MC	9.0MC	5.0-5.5MC	3.5-4.0MC	80M
40M		21.5MC	12.5MC	12.5MC		7.0-7.5MC	40M
20M		INOPERATIVE	9.0MC	9.0MC		14.0-14.5MC	20M
15M		25.0MC	16.0MC	16.0MC		21.0-21.5MC	15M
10M		32.0MC	23.0MC	23.0MC		28.0-28.5MC	10M
10M		32.5MC	23.5MC	23.5MC		28.5-29.0MC	10M
10M		33.0MC	24.0MC	24.0MC		29.0-29.5MC	10M
10M		33.5MC	24.5MC	24.5MC		29.5-30.0MC	10M

Fig. 3B — Output frequency development chart.

known for its stability of operation. The components chosen and the placement of the *vfo* all contribute to its exceptional stability and resetability. A look at the tuning capacitor gives a clue to the reasons why this *vfo* operates as well as it does. Heavy duty endplates (better that ⅛" thick), wide spacing and solid construction of the dial mechanism keep this *vfo* well within the requirements of the average SSB oprator. For the first 10 minutes of operation it was found to drift about 350 cycles but after that the drift was negligible. In fact, after a solid hour of QSO the oscillator frequency was checked and found to be extremely close to the frequency to which it had been set with a 10 *kc* multivibrator. The voltage to the oscillator plate is stabilized with a VR tube.

One feature of the HT-37 which quite evident after a week of operation was the excellent carrier suppression and the ability of the rig to maintain this suppression without adjustment. Once the carrier had been nulled it was not necessary to touch the carrier null pots on the panel at all. The only reason for the carrier null adjustments on the panel would be for insertion of carrier or for slight changes in tube characteristics due to aging.

Changing bands with the HT-37 emphasized the versatility of this little rig. A flick of the bandswitch, two tuning adjustments, places the transmitter on any one of five bands. For convenience it is difficult to imagine anything more simple. As a check on this aspect of operation, a local ham, unfamiliar with sideband operation (poor fella) was invited to operate the rig. He was amazed at the simplicity of operation and was able to change bands and retune in a matter of seconds.

Keying

Both mixer grids are grid block keyed offering chirpless and extremely stable CW operation. In the model tested the addition of capacitors changed the characteristic of the keying from very soft to medium hard with no trace of clicks anywhere in the band. An R-C type key-click filter is very effective in suppressing any tendency toward key clicks and several hours of enjoyable CW operation were possible just with the flick of a switch. The unit is not wired for complete break-in operation on CW, but operations is so simple with the way it is that break-in was not missed.

The Vox circuits proved a joy to operate and very little effort to adjust. One feature of the Hallicrafter's Vox circuit is that the delay for hold-in time can be adjusted. This feature allows the operator to determine the time lag that he desires and set it. The antitrip circuit allows the microphone to be placed near the speaker and not trip the transmitter. It has a sensitivity adjustment which permits the operator to determine the volume level best suited to his operating habits and set up the antitrip so that the rig will be stable at this point. The operation of the Vox was found to be sure fire and offered no problems of adjustment.

The final amplifier and driver stages resemble those of the HT-32, the only difference being the elimination of the safety cage around the 6146's (which is unnecessary since the top access cover is not hinged). Convection cooling was found to be quite adequate and the elimination of fan noise was a boost to operation.

A word about the instruction book; as complete and well written a book as appears with any equipment. Complete circuit description and details, photographs, line drawings and a complete alignment procedure make this an excellent example of technical writing. The operator should have little or no difficulty in getting the most out of his HT-37 if he reads th instruction book carefully and follows the procedures outlined in it.

As an overall picture, the HT-37 offers to the newcomer and veteran alike, a fine piece of equipment which emits a first class signal of which no one need be ashamed. ■

G4ZU ANTENNA QUIZ ANSWERS

[*from page 22*]

DO NOT read until you have had a go at the questions.

Penalty for cheating: 100 points.

1. No. R.F. travels more slowly in wire. Normal length is five per cent shorter than a half wave. Shorter still with large diameter tubing as used for beams.
2. No. May be anything from 30 to about 100 ohms, according to height.
3. No. The currents in the upper and lower wires are travelling in the *same* direction and transmission line theory therefore does not apply. Do *not* cut short.
4. Wrong. Plenty of high angle radiation off ends.
5. No. Increasing height produces multiple high angle lobes.
6. No. Very little current flow at the extreme ends and loading coils will do precisely nothing.
7. No. At all normal spacings, a director gives the best F/B.
8. Whether you put yes or no we'll give you this one. Strictly speaking, ground wave dies out after 100 ft. or so. Cross town communication is by *space wave*.
9. No. If you don't believe this build yourself a SWR bridge.
10. It can and does. Due to standing waves, and current induced when it passes through field of the antenna.
11. No. You can have high F/B with no gain at all. All the same its nice to have *some* F/B.
12. No. Read W6SAI's Beam Antenna Handbook.
13. No. No room to explain why.

DX DX DX DX DX DX DX DX

Urban Le Jeune, Jr., W2DEC
416 North 15th St., Kenilworth, N. J.

The following certificates were issued between April 15th and May 12th, 1960:

WAZ

1345	SP5AA	Edward Pokropek
1346	WØLPA	C. B. Frazer
1347	W1FQA	James V. Young
1348	CE3AX	Luis M. Desmaras
1349	W3GRS	Richard G. Weiler
1350	W1CTW	Calvin F. Hadlock
1351	W1ACB	Charles F. Anderson
1352	JA3FT	Kin-Ichi Ikeda
1353	W8WBV	Louis Camp
1354	W4JJL	Paul Lustig
1355	K5BGB	Roddy Hotz
1356	W6WQT	Herbert T. Henry
1357	VE7VC	Victor W. Cumyow
1358	W2ZY	Lin Lessig
1359	W6CUL	Lloyd Hines

CW WPX

113	IT1AGA	Giuseppe de Luca
114	HB9TT	Alfred Jenk
115	SM5BPJ	Sune Ericsson
116	K2ZKU	Edward Gaudet
117	W9WIO	James Zvolanek
118	W9UX	Roy W. Weisbach
119	W2BYP	George A. Mack
120	W8PQQ	Albert H. Hix

Phone WPX

16	VE1ADE	Rev. L. J. Ayers
17	W8PQQ	Albert H. Hix

SSB PW

29	W8PQQ	Albert H. Hix

WPX Honor Roll

CW WPX

W2HMJ	553	W2PTD	410	SM5AJU	359
W6KG	513	W6WO	409	VE3DIF	357
W5KC	477	W9YSX	408	DL7CS	356
K6CQM	455	W5AFX	407	KL7MF	356
W1NLM	455	W8JIN	403	W5OLG	356
W8KPL	453	W3BQA	401	W8LY	354
W2EQS	429	W2MUM	400	K9AGB	354
K5LIA	428	W9UXO	390	W5AWT	353
OK1MB	428	K4JVE	377	WØPGI	353
W8PQQ	418	WØQYE	377	HB9TT	351
W4OPM	411	W9DYG	367	W5DA	351
K6SXA	410	W4AZK	365	K2UKQ	350
W1EQ	410	W9QGR	361	VK3BK	350

Phone WPX

W8WT	480	PAØHBO	363	W8PQQ	327
G3DO	437	PY2CK	354	W5ERY	315
CT1PK	431	5A5TO	353		

SSB WPX

W8PQQ	250	K2MGE	203	DL4AS	166
TI2HP	231	W1GR	203	W3MAC	165
HB9TL	221	K2HEA	181	VE3MR	164
K9EAB	204	W6BAF	170	TG9AD	160

As I am putting this column together, I am still trying to recover from the Dayton Convention so if things aren't up to par, please excuse me.

A terrific time was had by everyone as usual. Over 2700 people were registered and over 900 attended the banquet. Bill Orr, W6SAI/3A2AF, was the guest speaker and made everyone drool with his talk about the French Riviera and his operation as 3A2AF. The main prize, a complete KWM2 was won by an unlicensed YL of all things. I understand she had four proposals that night. The DX forum had about 400 in attendance and talks were given by the North Jersey DX Association, W8MXS on his Galapagos Islands trip, and W3DHJ had them rolling in the aisle while relating his experiences in 3W land while helping Rundy operate W3ZA/3W. Your Truly tried his hand at public speaking but promptly put everyone to sleep. While W2JT was giving his talk, there was a loud blast as someone's 6 meter signal came over the PA system—poor Earl can't get away from QRM no matter where he goes.

Early Saturday afternoon, while relaxing after my bout with public speaking, A1, W8PQQ, said "Urb, would you mind coming down to my room and checking a few cards?" Did you ever see a suitcase full of QSL's? I think my hair stood up straight as he presented me with his WPX QSL's; 418 on CW, 327 on phone, and 250 on SSB. If anyone knows what happened at the convention after this incident, I'd appreciate it if they'd let me know.

CQ was well represented with K2IEG, K2MGE, K2HEA, W1FZJ, W3ASK and W2DEC in attendance. Too bad W2HDM, W1WY and W6TNS couldn't be there to make it a clean sweep. W1HDQ was there from the ARRL.

I hope you enjoy the pictures taken by W8OCT of some of the DX gang. The captions are also the courtesy of W8OCT, however, the beverages are courtesy of the NJDXA. If you like the pictures, I'll run some more next month.

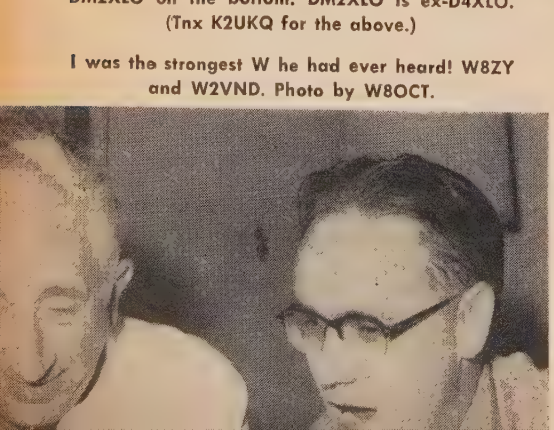
It was good to see Arkie, W8NBK, and hear that he is back in the rat race again. Likewise that Don, W4KVX, is ready to roll with his F.B. DX magazine. Don had everyone's mouth watering while telling about his new 90 foot pole.

The NJDXA would like to thank the kind soul who returned a certain lost W2 on Saturday morning.

The president of the Philippine Amateur Radio Association and frequent contributor to this column Pidio, DU1RTI, and family. Pidio said his XYL and jr. are his morale boosters but I don't think he needs it with the two BC 610's in the background.

Two very popular DM's, DM2ADB on the top and DM2XLO on the bottom. DM2XLO is ex-D4XLO. (Tnx K2UKQ for the above.)

I was the strongest W he had ever heard! W8ZY and W2VND. Photo by W8OCT.



If you would like to have the time of your life, try to keep the first weekend in May open next year. . . . You'll have a time you'll never forget. . . .

Now, down to business. . . .

Letters

The following letter from W2GKE is self explanatory.

"K2LSU, K2TVY, K2OQA, and W2GKE will leave Bayonne on July 29th at midnight and drive continuously to Sydney, Nova Scotia to try and obtain a sailing on the S/S Miquellan or Langlade on July 31 or August 1st.

We are taking a Viking 2, Viking VFO, SX100 receiver and a DB23 preselector. The antennas will be a 40 meter dipole, 40 meter ground plane and a Mosley Tri band antenna. We will have a crystal on 7025 which will be used as main frequency for CW in case VFO fails. We will operate 15, 20, and 40 meter CW and 10 meter Phone. No Phone operation is contemplated at this time on the 15, 20 and 40 meter bands although if conditions warrant we will probably use these bands also.

We expect to be able to operate at FP8 August 1 thru August 11th, approximately. However, boat connections will determine our operating time. QSL via K2VZJ. We will make every effort not to QSO any stations that operate on our frequency. We will only QSO stations who call us about 5 *kc* lower or higher than our frequency. We intend to use our VFO as much as possible to work various sections of each band."

The following is from Dennis, ex GM5RH:—

"To my knowledge, I was only GM5 station at all active on the DX bands in recent years and, as such, was in considerable demand by WXP hunters. Unfortunately, owing to the nature of my work, I was away from home for long stretches, and the position has now arisen that I have had to close down the stations in Greenock permanently, and become just a plain 'G5'.

I've always done my best to acknowledge QSL's received promptly, and, in fact, normally sent a card direct immediately after the QSO. If, however, any station I've worked still has not received a GM5RH QSL and wishes to have one, a direct card to the address below will ensure an air mail reply and I can't say fairer than that.

I hope to be back on the air from this area with sideband and CW within the next few months, and am looking forward to renewing old friendships and making new ones on the DX bands".

Dennis' new QTH is: c/o International Marine Radio Co. Ltd., 49 Oxford Street, Southampton, Hants, England.

AC3 Sikkim—A station has shown up on 14045 around 0500 GMT signing AC3PN giving his name as Joe and QTH as Gangtok. Does anyone have any more info on this one? (Tnx WØIJN)

AC4 Tibet–W9KOK has the complete logs of AC4YN and can furnish a QSL if you failed to receive one. SASE and no duplicates. (Tnx WGDXC)

AP2 East Pakistan–Colin, AP2CR, visits East Pakistan on business once a month and will try and operate from there in the near future.

DL4 Germany – DL4EF/K6DWY has a well-known group of men in his commo platoon. They are PFC Tom Dooley, Sp/5 Charlie Brown, and Pvt. Glen Miller, hi. According to Bill, the best band to the states from DL4 is 28 *mc*.

EAØ Spanish Guinea–EAØAB is quite active on 14 *mc* CW around 20 to 23 GMT. EAØAC is on 14305 most days around 1300 GMT. QTH for both is PO Box 195, Santa Isabel. (Tnx DXer)

EP Iran–Frank, W2AYN/EP, is doing a land-office business now that the EP ban is off. He has ordered a three-element beam and SSB gear from the states and will be active for over a year. At the time of this writing, only W2AYN/EP and W3ZA/EP can legally be worked.

FB8 Comoros Islands–FB8CD, who is active on 21 *mc* at 14-19 GMT, now has company from FB8GP. 8GP likes 21210 *kc* and his 200 watts does a good job. FB8CD should be getting Ted Henry's SSB rig about the time you read this. (Tnx DXer)

FM7 Martinique–A station signing FM7WQ on CW lately is N.G. as Pierre operates no CW. (Tnx WA2BLH and W2WK)

GB England–A station will be set up at the Liverpool Show again this year. They used the call GB3AHD last year but are trying for GB2LS this year. The attendance last year was over 100,000. They will be QRV from July 14th to 16th.

HL Korea–At the present time there are only six authorized stations in Korea and these are all club stations. Each station is authorized to operate but one assigned frequency for Phone and one for CW on 14, 21, and 28 *mc*. HL9TA is QRV from Korean Radio League's headquarters at Box 162, Seoul, Korea. HL9's, KJ, KR, KS and KT are the others. HL3AP and HL6KEF are said to be in North Korea. (Tnx FEARL and DXer)

KS6 American Samoa–Paul, K6CQV/KS6 will return to KS6 land about 15 June. At that time he will have SSB gear. (Tnx FEARL)

UA Franz Josef Land and Wrangel Island–There is presently no activity from either of these two spots nor is there any planned in the near future. This from RAEM, via K2UYG, who certainly should know.

UAØ Tana Tuva–UAØKYA is active from this spot, which is Zone 23 for WAZ, and his direct QTH is Ivan Chermenko, Radio Club, International Street 49, Kyzyl, Tavinian Autonomous Oblast, U. S. S. R. (Tnx K2UYG) He is on around 07-08 and 02-03 GMT. RAØYAA is QRV on 28 *mc* Phone.

VQ8 Mauritius–VQ8's, AV, AM, and BA prefer 28 *mc* around 15-1830 GMT, VQ8AJ, ex VQ8AJC, is active on 14 *mc* CW around 14-16 GMT. (Tnx DXer)

VQ9 Seychelles–VQ9TED will be operating from the Seychelles from August 22 to March 13, 1961 with a KWM1, 75A4 and Eddystone receivers. He will also go to Aldabra, Mauritius, Chagos and other groups of islands in the Indian Ocean during this period. (Tnx W2SUC)

VR1 Gilbert Islands–VR1B is QRV at 06 GMT on 21 and 28 *mc* Phone and also 10-12 GMT on 14 *mc* CW–mostly weekends. (Tnx DXer)

VR4 Solomon Islands–VR4JB, who was very active on 14 *mc* Phone every morning for about a year, is now almost QRT. Now and then, VR4BW shows up on 14 *mc* Phone and CW, but he is away most of the time as a /MM operator. (Tnx DXer)

VS4 Sarawak–VS4BA is very active on 14086 *kc* around 13-15 GMT. Likewise, VS4FC around 14100 CW at 15-16 GMT.

VS5 Brunie–VS5AD is active on 21240 *kc* Phone around 1000 GMT. QSL via Tom, VS5AD, Box 124, Brunie, Borneo. (Tnx FEARL)

YA Afghanistan–YA1AO/DL1AO is teaching radio to a class of 20 Afghan boys and they would greatly appreciate a few copies of the Radio Amateur's Handbook, if anyone would be so kind as to donate them. They are very anxious to learn about ham radio. How about helping Herbert out. K6BX passed along Herbert's letter. Cliff, by the way, is taking over W3RPG's certificate directory.

YK Syria–YK1AK is active on Thursdays around 15-16 GMT about 14150 *kc*. Also at 19 GMT, same frequency, YK1AT occasionally operates around 14300 *kc* CW at 06-08 GMT. QSL via OK bureau. (Tnx DXer)

ZS2 Marion Island–ZS2MI is occasionally active on 14305 *kc* around 1600 GMT. QSL via ZS6ANE.

ZS7 Swaziland–ZS7R is ex ZS8R es ZS6AVM and is active on 15 and 20 meters CW with 50 watts and a S76. His QTH is V. V. Parkhouse, P.O. Box 98, Mbabane, Swaziland. (Tnx W3SOH)

Certificates

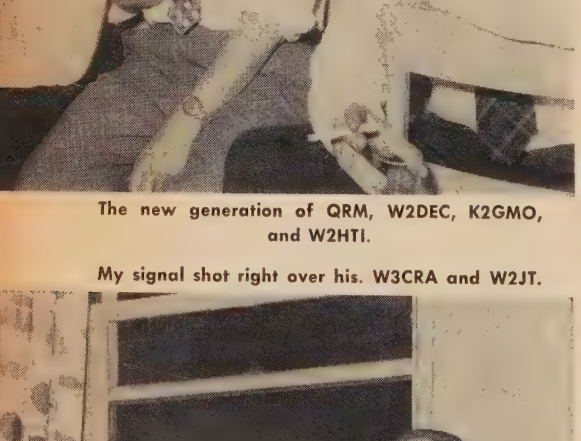
F9IL passes along the new rules for D.P.F. and D.U.F. It should be noted that W3ZA/3W, XV5A, 3W8AA, and French Guinea, after 1 October, 1958, are not eligible.

D.P.F. (Diplome Des Provinces De France)

The DPF certificate is delivered to any amateur submitting proof of two-way communication with a fixed amateur station in every one of at least 16 provinces of France, since January 1st, 1951. DPF is issued either for Phone or CW work, in one or more amateurs bands.

Applications to DPF must be sent to REF–BP 4201–Paris RP. The DPF Manager is Jean

Over the week end I plan on putting up a rotary rhombic. W9YFV and WØEDX.



The new generation of QRM, W2DEC, K2GMO, and W2HTI.

My signal shot right over his. W3CRA and W2JT.

Morpain F3ZU, 6 Allee Polin, La Frette S Seine.

D.U.F. (Diplome De L'Union Francaise)

The DUF certificate is delivered to any am teur submitting proof of two-way communi tion since April 1st, 1946, with fixed static in the French Union, or with fixed stations French expeditions in foreign countries, or w portable amateur stations (French or forei ones) temporarily licensed in the French Unic

DUF is issued either on A3 or A1, or o A3, on one or more amateur bands. DUF cludes 4 different parts:

DUF/1: Working at least 5 countries locat within 3 continents;

DUF/2: Working at least 8 countries with 4 continents;

DUF/3: Working at least 10 countries with 5 continents;

DUF/4: Or Excellence—: Working at le 16 countries within 6 continents.

Any amateur who gets DUF/4 may obta the Silver Medal of DUF, bar engraved w call letters and award number (Cost $2.00 18 IRC, or even equivalent foreign mon post paid)

DUF stickers are also issued at the follo ing number of countries: 20, 24, 28, 30, 3 32, etc. . . . Cost 1 IRC and return postage confirmations. Applications to DUF must sent to REF—BP 4201—Paris RP. The DU Manager is:—F9IL, Edmond DuBois, Aubc cheul-au-Bac, par Aubigny-au-Bac, Nord.

Either DPF or DUF Award will be award to any amateur who will submit to manager

1:—a letter dated and signed, proving obs vation of all the rules as well as regulatio established for amateur radio in his ho country and containing the detailed list of s tions worked, with date, time, band, indic tions of A1 or A3:

2:—the confirmations;

3:—the amount of currency for the retu postage of the confirmations;

(a) Canada, Luxembourg, Saarland:
1 IRC for 1 to 12 normal QSL;
2 IRC for 13 to 25 QSL.

(b) Other foreign countries:
1 IRC for 1 to 4 QSL;
2 IRC for 5 to 10 QSL;
3 IRC for 11 to 20 QSL.

2 more IRC are requested for register mail. More IRRC are also requested for a mail return postage.

More Awards

The three awards listed below are by D Havlicek, W8QHW, 3156 Timberview Driv Cincinnati 11, Ohio. All applications shou be addressed to him.

WAS-N

WAS-N award for confirmed contacts wi Novice stations in each of the 50 states of t U. S. Only contacts made on or after Janua 1, 1959 apply. (QSO's with WH6 after Jan.

but before the admission of Hawaii will count). Apply with QSL's, and $1.00 which includes return of QSLs.

LBDXA

LBDXA award for confirmed contacts with 75 countries on 80 CW, 75 countries on 40 CW, 25 countries on 80 Phone and 25 countries on 40 Phone. All contacts must be post-WWII. Apply with list in log form in aphabetical by country order. Do not send QSL's. A number will be requested from your list. The failure to present requested QSLs will result in permanent disqualification. Charge is $.50 plus stamped reply envelope for return of QSL's when requested.

W-160

W-160 award requires confirmed contacts with 10 different countries on 160 meters. Contacts may be A1, A3 or any combination of both. Apply with QSLs and $1.00 which includes return of QSL's.

There is no charge for non-W/VE stations for the above certificates.

QTH's

AP4M	via RSGB
BV3HPT	Box 11, Shin-ti'en, Taiwan, Formosa, China
CN2BE	Box 2057, Tangier, Tangier Zone
CN8HQ	via P. O. Box 41, Putnam, Ill., U.S.A.
CN8JF	via W8UWT
CT3AV	via W3KVQ
DL4MG	Wm. W. Adams, W5WW, NSA Europe, APO 757, N.Y.C.
DM2AEN	Hans Sommer, 29 Ulmenstrasse, Karl-Marx-Stadt, German Dem. Rep.
EA8CG	via K1DCL
EA8CP	Box 215, Tenerife, Canary Islands
ETE3CE	Box 385, Addis Ababa, Ethiopia
FD8AMS	via W6UKT
FQ8AE	Box 467, Brazzaville, Republic of Congo
FQ8AF	Box 2203, Brazzaville, Republic of Congo
FQ8HK	Box 919, Brazzaville, French Equatorial Africa
HRØAB	via HR1AB
HZ1TA	Box 195, Riyadh, Saudi Arabia
I5TUF	P.O. Box 16, Mogadiscio, Italian Somaliland
KC6JB	c/o U.S. Weather Bureau, Koror, Western Carolina Islands
KG6CY	Box 445, Agana, Guam
ex KR6HV	via W6MSH/7 4713 127th SW, Tacoma 99, Washington
KS4AZ	Ralph Ladd, W3KA, 10406 Insley St., Silver Spring, Md.
KV4CG	Ivan C. Lundblom, Gen. Del., Frederiksted, St. Croix, Virgin Is.
LA6CF	via W6/K6 QSL Bureau, San Diego, Calif.
LU1DRA	via KP4APL
LU7ZL	Demetria Luizon, Dolores 186, Buenos Aires, Argentina
MP4TAF	Sgt. Derek Leese, A Sqn. Royals, B.F.P.O. 64, Sharjah, Trucial Oman, Persian Gulf
OQ5IE	via K2MGE
OY7BS	via W3KVQ
PJ2MG	via PJ2CE
TA3GI	via VE7ZM
TF2WEM	Area Engineer, APO 81, New York City, N. Y.
TF2WEZ	c/o MARS, APO 81, New York City, N. Y
UF6BX	Yu. I. Berzutsky, Radio Club, Pushkin Street 13, Kataisi, Georgian SSR, USSR
VK9DH	via WA6HOH
VK9TK	Karu, c/o P.O. Kavieng, New Ireland, T.N.G. or via WA6HOH
VKØAB	via VK3APV
VKØPM	via VK4PM
VP2AR	via W9ZRG
VP2DX	via W8VKJ
VP2KD	Fiennes Ave., St. Kitts, W. Indies
VP2KH	via W2CTN
VP2LS	via W8QHW
VP2ML	via KS4XO
VP3IG	P.O. Box 331, Georgetown, British Guiana
VP6BY	via VE6BY
VP7BI	via W4ISH
VP8BE	via RSGB
VP8CC	via G3JAF
VQ2AB	via W6BAF
VQ6GM	Box 164, Berbera, Somaliland Protectorate
VR3Z	via RSGB
VR4JB	Box 49, Honiara, Solomon Islands
VS1KM	via W9ZFG
VS4FC	Telecoms. Dept., Bintulu, Sarawak
VS5PM	P. K. I. Mohamed, Telecoms. Dept., Brunei
VS9ARF	via G3MJI
VU2RM	via W3KVQ
VU2XG	via G3VG
XZ2AD	via WØUUV
XZ2SY	via W4ANE

[*Continued on page 104*]

Secrets, that's all a guy needs to work DX. W9IOP and W3GHD.

Well, where is my last issue of DX? W8CQ and W4KVX.

ham clinic

CHARLES J. SCHAUERS, F7FE/W6QLV

CQ Magazine, 300 West 43rd St., New York 36, N. Y.

Some Thoughts On VHF Modifications

Judging from the number of letters received each month by HAM CLINIC on the subject of transmitter modification for 6 meter operation, it is evident that more hams are suddenly realizing that *vhf* can be just as much fun as the frequencies below 29.7 *mc*. However, there seems to be a prevalent (but erroneous idea) that all one need do to convert the average so-called all band rig is to "pop" an overtone crystal in its oscillator crystal socket, short out turns on 10 meter coils and one "is in business." Well, it isn't quite so simple.

Most ham magazines receive many modification articles but few are chosen because the modifications are often too complicated and require that a set be "butchered" to a major degree. The low efficiency conversions seldom find their way into print either because who wants to put 100 watts into a doubling or tripling final to get out a mere 30!

A frequently asked question is: "how about using the 11 or 160 meter position in my rig for a 6 meter conversion?"

The answer of course depends on the transmitter and the trouble the owner wants to go to get what he is after.

If all lower frequency components could be left in and a few minor changes made this would be fine, but this generally cannot be done. For example, *rf* chokes designed for the lower frequencies and high value interstage coupling capacitors do not operate well on 6 meters. Coil substitution is not the only major problem that confronts the guy who wants to convert to 6 meters. If *separate* coils and sufficient switch contacts are available, the 11 meter coils can be removed and proper 50 *mc* coils substituted. Tapping down on existing coils is not an efficient way to do it.

In most rigs designed for crystal controlled operation, the oscillator will use either 40 or 80 meter crystals. An overtone crystal for 50 *mc* operation, when plugged into the crystal socket, will not oscillate. By adding regeneration the third over-tone crystal (usually used for 50 *mc* operation) will work fine—but, then you will need an output coil tuned to the proper frequency feeding a buffer-amplifier whose output is also tuned to the proper frequency; into perdaps another doubler then into the final amplifier. Remember that the fewer the stages, the *less* efficient the *vhf* rig will be.

If *too much* regeneration is added to the oscillator one will find that the crystal is not doing much frequency controlling!

By using a ceramic tap switch it is possible to design an outboard overtone circuit which can be switched into the oscillator for 50 *mc* operation; for regular operation it is simply switched out.

The simplest circuit I have ever seen for 50 *mc* operation uses but three tubes and performs very well. A 6C4 crystal oscillator with either an 8.4 or 25 *mc* crystal feeding it, into a 25 *mc* tuned circuit into another 6C4 doubler to a 2E26 final amplifier. Anyone desiring a copy of the circuit may have one free if they enclose a stamped self-addressed envelope with their request.

Now then, the best way to tackle the modification task of the DX40, DX100, Viking I and II, TX-1 and other popular transmitters is to start with the oscillator and work toward the final.

First, pick out a good overtone circuit from one of the handbooks and *plan* the switching of the necessary elements into the oscillator tube. *Some* of the resistors, condensers etc., of the original circuit can still be used. The plate to grid feedback circuit of the 50 *mc* oscillator is no problem as long as you use *short* leads and do NOT try to mount the ceramic switch on the front panel a foot away from the tube. Better to mount the switch next to the tube (and crystal sockets) and use a bakelite extension shaft.

After you have the oscillator working, the next thing to do is to install a ceramic slug tuned coil in its plate circuit that can be switched in (with available switch contacts or a separate switch). If you use overtone crystals (and you should), this coil can be resonant at 25 *mc* and consist of say a National XR-91 3/8" form on which has been wound about 22 turns of #30 connected to the input of the second tube (buffer-doubler) through a small capacitor (50 to 75 *mmf*). The doubler then feeds a second (switched) tuned circuit for 50 *mc* which is coupled to perhaps a buffer, then straight through the final to the antenna.

The high distributed capacitance at 50 *mc* found in the average transmitter's final tank

makes tapping down on the 10 meter coil an inefficient operation; so a separate final 50 *mc* coil should be used. I advocate that the 50 *mc* tank be completely separate and not to use *any* of the lower frequency components.

RF chokes should be the VHF type such as *Ohmite's* Z-50.

A few pertinent tips are in order if you plan to modify your rig for 6 meter operation. Watch your crystal current and keep it as low as you possibly can. Do not try to "pull" out more power than you do on the lower frequencies, you'll encounter parasitics galore and TVI! Neutralization will be more than likely necessary—even with a beam tube. Do use small (10 to 47 ohm) resistors in series with the grid of the tube feeding the final *and* the final grid. Use *heavy* but *short* connecting leads in *rf* circuits. 50 *mc* coils should be oriented so that they are at *right angles* to any other low frequency coils.

The following articles on 6 meter modification have appeared in *CQ* and *QST: CQ:* Collins 32V to 6 Meters, April 1958; AF-67 to 6 Meters, October 1958; Globe Scout to 6 Meters, Nov. and Dec. 1956. *QST:* Viking Ranger, April 1959; Viking Adventurer Sept. 1958; DX40 August 1958; DX35 December 1958; AT-1 May 1957 and Viking I, December 1952—all conversions to 50 *mc*.

When the DX40 conversion to 6 meters (*my version*) is completed, it will appear in this column.

Observation

On Form Letters—One of the readers of HAM CLINIC sent me a letter he received from a very reputable manufacturer. This letter was in response to the reader's query for technical help on a receiver—the letter was a *mimeographed form letter*. To me, the answer was logical, sympathetic and helpful, but to the reader (who felt that he should receive *personal* service) it appeared to be a polite "brush-off."

"The only sense I got out of the whole letter," the reader said in his communication to me, "was that if I couldn't locate my trouble I was to ship the set to the factory. How is it that a manufacturer uses *form* letters when the answer I want is not contained in them?"

As has been pointed out before, no one is perfect and sometimes an assembly line does "slip" a bit resulting in a peculiar circuit trouble. Although correction is made as soon as it is found, some of the sets do get to the customers. So when a customer writes in relative to a symptom that points toward that assembly line "slip-up" he will receive a form letter dealing with the particular trouble. The answer is detailed and rapid *because* a form letter is used. However, the customer's description of his trouble may not be too clear and may not be the trouble whose cure is described in the form letter. No one (except *Ham Clinic*) likes to take a "crack" at solving troubles by mail and this is usually plainly stated in form letters.

Now it has turned out that the correspondent who sent me the form letter did have a set with the trouble covered by the form letter *plus* one other! I supplied him with *another* form letter covering the second trouble and now he is happy.

Observed: sometimes we are a little hasty in criticizing the help we receive. In this modern day and age, *forms* are a necessity and often do contribute rather than detract from efficiency. Be SURE when you complain to a manufacturer that you state your problem as lucidly as you can—like the doctor (or *Ham Clinic*) diagnosis can only be effective when the symptoms are properly described.

Tech Information

Surplus Schematics—Those of you who have been having difficulty obtaining schematics or instruction manuals for various surplus items write *Bill Slep Co.*, PO Box 178, Ellenton, Florida for a list.

Modifications for the Johnson Challenger—Challenger modification Kit #23.1406 for improving the overall operation of the set is now being offered by the *E. F. Johnson Co.* for $5.00 (postpaid). This kit increases reserve grid drive on all bands, especially 6 meters; improved high speed keying on 6 meters; higher 6 meter output; more stable operation; better final amplifier tube cooling; reduced standby current of the final amplifier by final screen grounding etc.

Viking Messenger to 10 Meters—Full information on converting the Johnson Viking Messenger Transceiver from CB operation to higher powered 10 meter operation using only a few parts is covered in March and April (1960) issues of the *General Electric Ham News*. If you are a Messenger owner, send the *Johnson Co.* the serial number of your set for gratis conversion instructions.

5D21—Letters have been received from hams who have been or are using the surplus 5D21 successfully as high powered final *rf* amplifiers. I still do not "see" them for ham use even though they are inexpensive. What happens when no more are available? 28 volt filaments? Well, maybe they can find some 4PR-60 or 715Cs which are the same tube—nearly.

Questions

MR-1 Mobile Receiver—"Anything out yet on improving sensitivity, "S" meter response and audio gain of the *Heath* Comanche mobile receiver?"

Yes. To improve sensitivity, gain etc., first install a 2.2 mmf capacitor from lug #1 of the main tuning capacitor to lug #3 of terminal strip "G". This provides direct injection between mixer and oscillator sections of the 6EA8. Then, install a second 2.2 mmf capacitor from lug #3 to lug #8 on the 6EA8 tube socket—this will prevent any parasitic oscillation. Next, install a 470 mmf capacitor from lug #5 to the center ground post on the 6BE6 product detector tube

socket. This prevents frequency shift when *af* gain is fully in. If any oscillation is experienced on 40 meters after installing the components above and when adjusting the antenna trimmer, install a 10 ohm ½ watt resistor in series with the ground lead coming from lug #2 on the 40 meter antenna coil and going to the ground lug on the center partition shield. If there is oscillation on any other band, install a like 10 ohm resistor on the antenna coil of the band affected. Be sure to recheck calibration on *all* bands after installing the components.

NC 60 Hum "I note some hum in my NC 60. Filter seems okeh as well as tubes. Any info?"

Reroute the wire on top of the volume control direct to terminal strip at junction of B– of C1 and CX, .047 mfd *avc* by-pass condenser. This was originally connected to the low end of the volume control. Wire from low-end of volume control then goes to same point by itself—not cross-connected. See fig. 1.

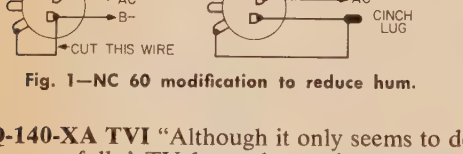


Fig. 1—NC 60 modification to reduce hum.

HQ-140-XA TVI "Although it only seems to do it on my folks' TV located upstairs, my HQ-140-XA receiver does create TVI. The neighbors' sets on both sides of me and across the street are not bothered. The receiver works fine, but it is no-go if my folks want to watch TV. What's the trouble 'doc'?"

The trouble is in your high frequency oscillator—too much 2nd harmonic radiation. First, tighten up the 6 front panel screws, then add three #10 external lockwashers under each of the three *rear* screw heads. Next, cut a piece of heavy aluminum foil the size of the receiver chassis and install it in the cabinet bottom. Allow enough aluminum to fold up around receiver chassis edges. These measures should do the trick. If not, solder a 1000 ohm ½ watt resistor from the 10-30 *mc hf* oscillator coil tap to the B+ bus. Bet your folks will be able now to watch TV without receiver TVI! Please remember that an oscillator is an oscillator—some put out more *rf* than others! Radiation does *not* indicate malfunctioning.

DX40 "Do you advise modifying the DX40 for plate modulation?"

No. You don't have "enough" transformer in the DX-40 that will provide sufficient current for both the final and a proper modulator .... for 100% modulation. That screen modulation works fine if you load the transmitter properly and do not scream into the mike!

SSB and FM "How come SSB and FM cannot be 'married' together for a super-duper communications system?"

You've been reading too many Rapp articles. But it is possible, but do not ask me how.

SSB Converter "How about some info on a crystal controlled converter with *bfo* for SSB mobile operation?"

I've only seen one—and a good one by W6BLZ in the Feb.-March (double) issue of *Western Radio Amateur* (1958).

Scope Display "Is it true that one can actually see two signals simultaneously presented on a CR tube screen by using a special type of electronic switch?"

Yes. For a simple circuit see fig. 2. Two signals are switched to one input (the scope's), so fast that you "see" *two* presentations, but in fact there is only *one* signal shown at a given time on the screen. This is a handy gadget for checking input and output waveforms.

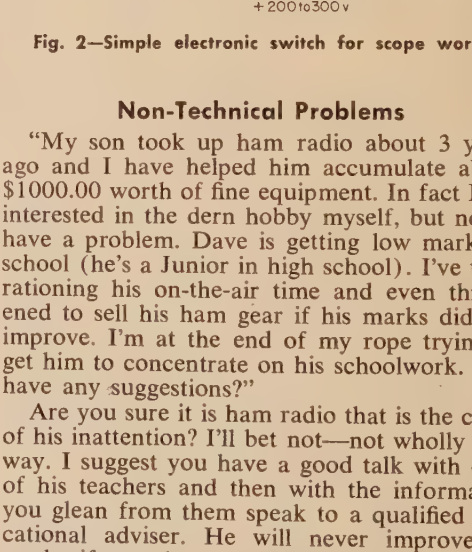


Fig. 2—Simple electronic switch for scope work.

Non-Technical Problems

"My son took up ham radio about 3 years ago and I have helped him accumulate about $1000.00 worth of fine equipment. In fact I got interested in the dern hobby myself, but now I have a problem. Dave is getting low marks in school (he's a Junior in high school). I've tried rationing his on-the-air time and even threatened to sell his ham gear if his marks did not improve. I'm at the end of my rope trying to get him to concentrate on his schoolwork. You have any suggestions?"

Are you sure it is ham radio that is the cause of his inattention? I'll bet not—not wholly anyway. I suggest you have a good talk with each of his teachers and then with the information you glean from them speak to a qualified educational adviser. He will never improve his grades if you close up his hamshack . . . if ham radio is the basic cause. I also suggest that you set aside an hour or two at night and actually assist him in his studies *before* he settles himself before his radio gear. If you help him personally, I'm sure he'll improve. Teaching the younger ones that every hour must be used wisely is the hardest task in the world—the hour lost in daydreaming is never regained. The man in today's modern world without an education has a hard row to hoe!

A Time for Everything "My husband's hobby is ham radio—period. From morning until night he's hamming. If he isn't hamming at

home he is hamming in the car. If he had his way we would visit no one but hams. The guy is getting impossible. If the loudspeaker in the car isn't bellowing then the ones (in every room) are squaking. We can't even eat a meal without some guy interrupting our conversation—what there is of it. Now he has decided to install a remote position (so he calls it) in the breakfast nook where we take most of our meals. Now what do I do?"

Lady, as much as I like ham radio I believe there is a limit. If you are not exaggerating, you're in one heckuva mess! I suggest that you buy an electric organ and a flute. Play the electric organ when he gets on your nerves in the house and blow the flute when you have to ride with him in the car. Then suggest to him that you are both "nuts" and should go to a psychiatrist together. Keep your sense of humor anyway and remember that a pair of pliers cuts wire ever so easily!

Tip of the Month

Thanks to the assistance of Gar Goodson of *International Rectifier Corp.*, El Segundo, California, those of you who have unmarked silicon diodes (rectifiers) can now determine their operational characteristics.

In fig. 3 is shown the diagram for checking the current rating of diodes. A thermocouple is required and must be attached to the diode base plate. Temperature rise is then measured above the ambient (room) temperature. Increase the

[*Continued on page 106*]

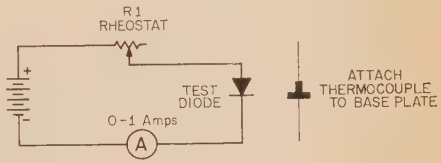


Fig. 3—Circuit for checking diode current ratings.

Flying Hams

Thanks to Jack Gutzeit, W2LZX, we have a rather lengthy list of fellow amateurs who have broken the air barrier and gotten their licenses to fly. Seems there is a pretty fair potential for increased aeronautical mobile activity with a healthy clan like this. By the way, there are some very well known personalities on this list including Arthur Godfrey and Butch Griswold. Tks Jack.

K1EGO	W2DIO	K2JHM	K2VAU	K4GG
W1IZ	W2DR	K2JQO	W2VEG	W4GQV
W1JIB	W2DZV	K2JVQ	W2VGQ	W4HCZ
W1JM	W2EHV	W2KAH	W2VHS	K4IHS
W1JTB	W2FCJ	W2KZS	W2VKS	K4IWB
W1LZV	W2FDL	WA2LGD	W2ZGA	K4JKP
W1NPY	W2FWG	W2LHK	K2ZMX	W4JQG
W1PRI	W2GG	K2LUR	K2ZPJ	K4LKY
W1SBM	W2GJX	W2LZ	W2ZRY	K4LIB
W1VLT	K2GBN	W2LZX	W3AMO	W4LZR
W1YUO	W2HBK	K2MGQ	W3CO	K4MLZ
W1ZD	W2HDM	W2MHM	W3DJV	K4OJV
W2AS	W2HNG	K2MMM	K3IBD	K4PQQ
K2AAN	K2HOK	W2MRJ	K3IBE	K4QNG
W2ABK	W2HTI	K2MWN	W3IXL	K4QYX
W2AQK	W2HZC	W2NRM	W3JSN	K4RFA
WA2AVT	K2IEY	W2NSD	W3PGH	K4RHG
W2BHD	K2IHD	W2NXZ	W3PQR	W4RRH
WA2BCS	K2IND	W2OBW	W3ZP	K4DUX
WA2BRY	K2IOG	W2OZD	W4ABZ	K4RUX
W2BKX	W2ISY	W2PNR	W4BAZ	W4SHG
W2BMV	KN2IUM	W2PYK	W4BHJ	K4SIX
K2BPM	W2IUX	W2PZE	W4BHR	W4UDG
W2BPV	W2IVW	W2RCQ	W4BJR/1	K4USM
W2BUS	W2IXJ	K2REC	K4BTX	W4VIW
K2BVY	W2IXT	W2RHN	K4CVG	W4VTT
W2CAN	W2JAO	W2RJM	W4DLH	W4WSS
K2CNF	K2JCC	K2RMA	W4DNO	W4YGY
K2CTK	K2JCZ	W2RNN	W4EEF	W4YIU
K2CTR	K2JDV	W2RRP	W4EHD	K4YYJ
K2CYA	K2JDZ	W2SCH	W4FHB	W4ZKE
W2DHN	K2JGG	K2TAQ	K4GCS	K5BGG

Jack, W2LZX

K5BTE	W6SRE	W8LTV	K9LFW	KØJST
K5CNI	W6SXI	W8LVQ	W9LXS	KØKFQ
K5DCM	K6ZXW	W8MRJ	W9OGP	WØLZL
K5MRU	K7AEJ	W8QBF	W9PMO	WØLZU
K5NFM	W7AOD	W9AON	W9RBX	WØNOD
W5OZI	K7BCK	W9AXL	W9RHS	WØOUS
W5QK	K7CET	K9BYK	W9TQT	WØRAM
K5SDM	K7DSR	K9CJH	W9TRN	WØRPE
W5ULI	K7ENQ	W9DDN	W9UWL	WØRXK
W5YCK	W7GI	K9DOX	K9VDW	WØTGL
W5YQO	K7GHZ	W9EMR	W9VXE	WØVOP
W5ZRA	W7LZU	W9GQI	W9WAF	KØZFR
K6BX	K8BTL	W9GXA	W9WNT	DL4TN
W6BZ	K8CFU	K9HFN	W9ZWF	EL4A
W6EFB	K8DXC	W9IEF	WØABF	KL7AHP
W6EPJ	W8EAI	W9IZI	WØAGD	KL7DJD
W6IZT	K8GBE	K9JFZ	WØBRK	VE2GQ
W6OJK	W8GDC	W9JUV	WØDMS	VE2WW
W6QEN	W8HWJ	K9KUC	KØDWC	XE2FA
K6QPI	K8KSA	W9KYV	WØFIC	
W6RMT	K8LTS	W9LBH	WØIBZ	

VHF

Sam Harris, W1FZJ
P. O. Box 334 Medfield, Mass

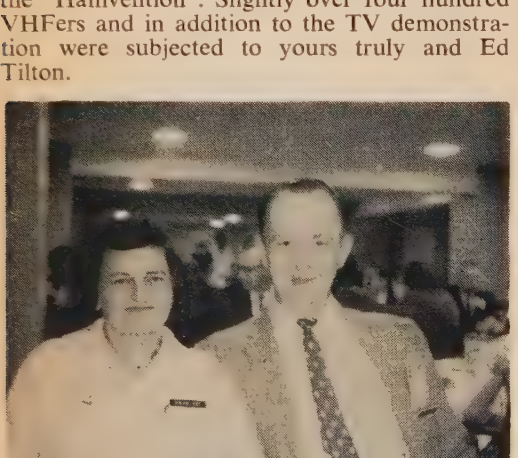
50mc. 144mc. 220mc. 420mc. and above

FLASH: *1296 Megacycle* Moonbounce *project now in operation. Echoes are now being received nightly on a frequency of 1296.00 megacycles. Time: 3 hours after moonrise E.S.T. until 3 hours before moonset E.S.T.*

Dayton Hamvention and Amateur TV

Well, they did it again! The Dayton gang, headed this year by Larry Brandenburg, W1TEK, ably assisted by the "Miami Valley VHF Club" members, put on another terrific VHF "DO". Starting off with the VHF dinner on Friday night and ending with the well attended VHF forum Saturday afternoon, the VHF gang found little time on their hands. Hit of the VHF forum was the amateur TV demonstration put on by John Hull, W8RRJ, with the assistance of the Columbus radio club gang. I am sure that a large percentage of the VHF forum attendance went away with dreams of how they might just be able to—etc., etc.

The VHF forum was the largest forum at the "Hamvention". Slightly over four hundred VHFers and in addition to the TV demonstration were subjected to yours truly and Ed Tilton.



That's a grin of relief you see on the two faces above. Larry Brandenburg (W8TEK), VHF Chairman for the Dayton Hamvention this year, and his charming XYL Kay, K8KYW, can now go on to other things now that Hamvention is over. Things like next year's Hamvention, Maybe?

Don't feel too badly if you missed it. They will do it again next year. (April 23, 1961)

Six Meters with the ARC-5/T23

Last month we printed some conversion data for the ARC 5/T23 VHF transmitter. This month Fred (W1FRR) came up with two more pieces of information. The first is coil data for getting the T23 on six meters, as follows:

For 50 *mc*, Channel A was used with the following modifications:

1. Remove 3 turns from coil 3A
2. Remove 3 turns from coil 3B
3. Add a 22 mmf condenser across coil
4. Remove final coil by unsoldering the co leads and unscrewing the brass clamp whic holds form in place. Rewind coil with 29 turn of 22 enamel wire. Replace presen tlink wit a turn link around the center of the coil.
5. Shunt the existing loading condenser wit a 40 mmf fixed condenser.
6. Place an 8 *mc* crystal, which falls in meters, in Channel A and tune up as outline in the previous article.

Some sources of trouble we ran into whil making these conversions were grounding pro lems with the plug in units and contact problem on the 832 pins, as well as the rotary contac which should be cleaned. If the plug in units a not making a positive ground, and you are usin *dc* on the filaments, the control box meter wi read in position 3 and 4 with THE PLATE OF The cure for this is to remove the 832 plug i units and adjust the grounding fingers on th main chassis so that they make a good conne tion agains tthe plug in units.

If available, a grid-dip meter would be help ful in making the modifications.

The first 1625 is oscillating at 8400 and doub ling to 16,800, the second 1625 is tripling t 50.400 which drives both the 832's straigh through.

Control Box for T-23

Figures 1, 2 and 3 show the control box wi ing and panel layout. Figure 1 is the meterin circuit and fig. 2 shows the band selector switch ing and transmitter control switch.

If the proper connectors cannot be locate for the front plugs, they are replaceable with

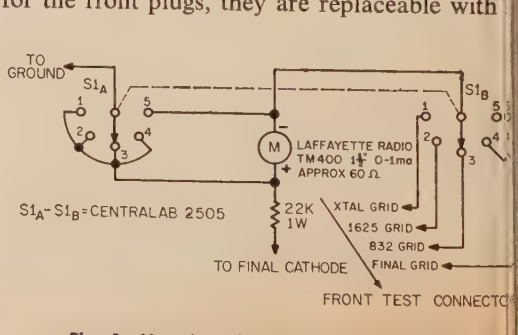


Fig. 1—Metering circuit for the ARC5-T23

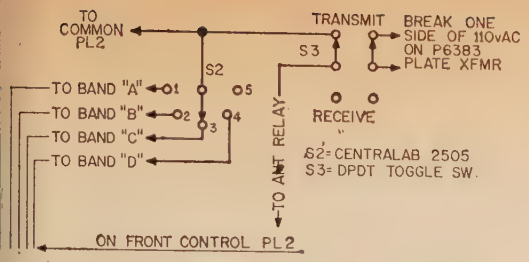


Fig. 2—Band selecting switch for the ARC5-T23.

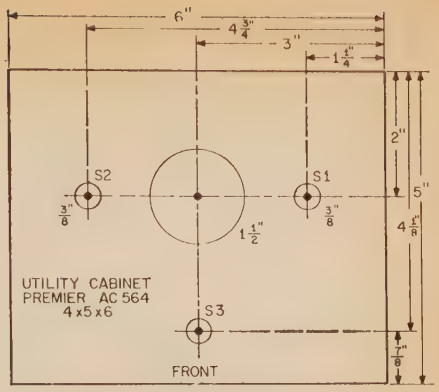


Fig. 3—Panel layout for the control box. ➔

pair of octal sockets or one octal and one nine pin so as to avoid plugging the wrong plug into the wrong socket.

The control box reads grid current of the oscillator in position 1 which shows whether the oscillator is operating or not. In position 2 it reads the second 1625 grid which should be peaked by adjusting slug 2. In position 3 and 4 the grid current on the 832's are being monitored and should be adjusted by peaking slugs 3A, 3B, and 4 respectively. Position 5 is measuring cathode voltage across a 300 ohm cathode resistor and should be dipped and loaded by the front panel adjustments.

The cable harnesses were brought out through the side of the minibox through 2 rubber gromets.

Moon Bounce Exciter

Henry Cross (W1OOP) just finished the exciter for the 1296 moon bounce project.

The diagram (fig. 4) shown here is for a high stability exciter for a 1296 *mc* transmitter. The point of the high stability is that for moon bounce or meteor scatter, or even for sideband work, it is very helpful to be where you say you will be—and stay there. A 9 *mc* crystal was

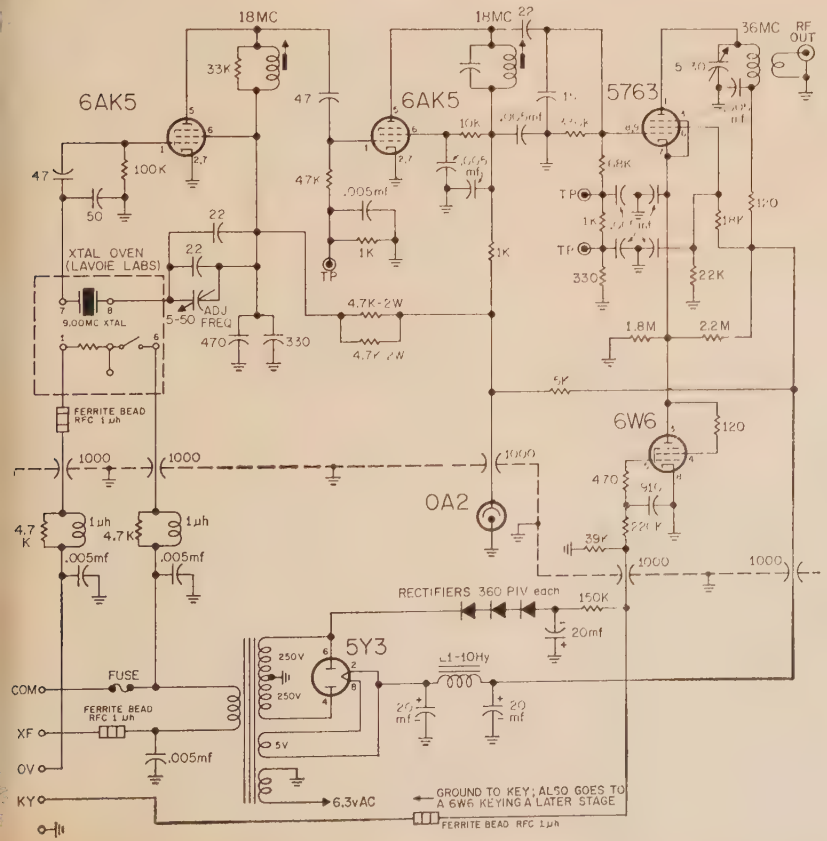


Fig. 4—High stability 36 mc exciter for the 1296 moon bounce project.

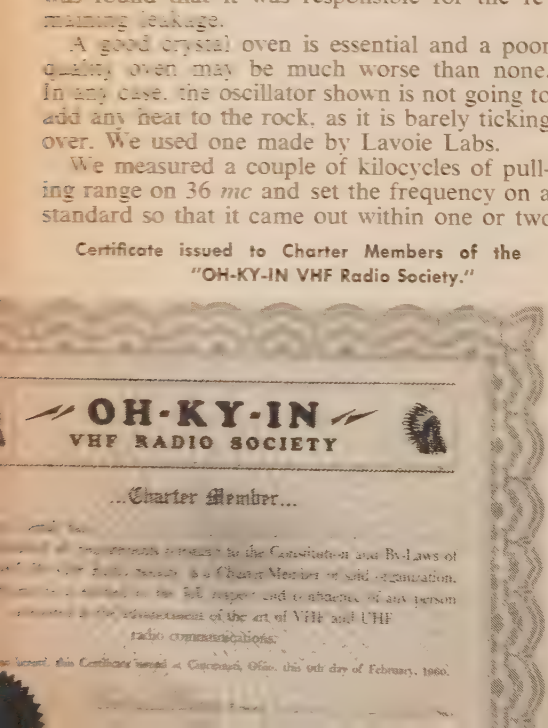
Charter Members of the "OH-KY-IN VHF Radio Society". What a beaming group!

picked to allow more doublers in the string than 8 *mc* would, but the circuit shown will work fine with an 8 *mc* crystal. The crystal oscillator and first buffer? doubler? (the tuned circuit is resonant at 18 *mc* but there is also fundamental drive on the second grid) run continuously inside the shield, with all the leads coming by way of 1000 mmf feedthru condensers, *rf* chokes, ferrite bead filters, etc. The 5763 doubler is keyed in its cathode by a 6W6 (other types which work well are 12B4, 6Y6G, or a pair of 6AS5's) and the key lead (short to ground to key on) also goes to the grid of another 6W6 keying a later stage. With key up and B plus off, the later stages, nothing can be heard on frequencies above 100 *mc*; we hope to be able to leave on the B supply, by separating the exciter and receiver slightly. We had to put a shield on the 6W6, incidentally, when it was found that it was responsible for the remaining leakage.

A good crystal oven is essential and a poor quality oven may be much worse than none. In any case, the oscillator shown is not going to add any heat to the rock, as it is barely ticking over. We used one made by Lavoie Labs.

We measured a couple of kilocycles of pulling range on 36 *mc* and set the frequency on a standard so that it came out within one or two

Certificate issued to Charter Members of the "OH-KY-IN VHF Radio Society."


OH-KY-IN
VHF RADIO SOCIETY

...Charter Member...

cycles. Fifteen percent line voltage change gave two cycles of apparently slow change; a Sola regulator on the line (less than half an amp drain) would remove even that.

Clubs

One of the many newly organized VHF Clubs is the "OH-KY-IN VHF Radio Society." Composed of members from Ohio, Kentucky and Indiana, this gang is really enthusiastic about VHF, their club and CONTESTS. They handed over a goodly number of logs from the April contest at the Dayton Hamvention.

Organized in February, 1960, club membership has already reached the grand total of 116 with attendance at monthly meetings running from 70 members on up. They have an official publication, "The Q Fiver" which is well written, growing in size with each issue, and berating members to get new members to build up their membership list.

Mail

Rusty (XE1PY), well known DX and DXer on six meters, acquaints us with conditions in his area on the weekend of April 16, 17 and 18:

"Saturday the 16th, 20 stations were in with good signals in the afternoon and evening, as they have been most days during the past weeks."

"Sunday the 17th, 7:30 AM the band opened to the States. It was open until noon with Texas, Oklahoma, Arkansas, Tennessee, Alabama, Mississippi, Louisiana and Florida. Worked some thirty odd stations. LU came in shortly after 1:00 PM and was in until after 9:00 PM. At 6:30 PM TG9JW came through with a 20 over 9 signal and was still in after 9:00 PM. XE1GE had a contact with Jack, TG9JW from 6:30 until 8:00. They, Jack and Geoff, have been waiting nine years for this opening. I had a contact from 8:30 to 8:45 with TG9JW, during which time a W5 from Brownsville came on my frequency and contacted him also. I did not hear the W5. I went QRT shortly after 9 so don't know when the band closed."

"Monday the 18th, at 8:00 PM the band was open to LU and W7 around Arizona. Had several good contacts with W7 but could not hang around to find out when it closed; nor do I know at what time it opened." *Three cheers, Rusty! Sounds like the good ole days, doesn't it!*

Livingston, New Jersey. A sidebander on six would like you other sidebanders "to give". Phil Gural (K2PCG) sez: "Some of the local sidebanders and myself would like to get some idea of how many sidebanders operate SSB on 50 *mc* and above throughout the United States. We want to compile a list so that when DX is coming through, on 50 mc as an example, we may know who and what frequency the sidebanders operate in their area."

"Would like to have Call—Name—Address; also

1. Approximate operating frequency.

2. VFO on crystal controlled.
3. Time the station usually gets on the air, and if on a net, the starting time.

This information should be sent to K2PCG, P.O.Box 603, Livingston, New Jersey." *Sounds like a very good project Phil. Would appreciate a copy of the list after you do the compiling work.*

Pascagoula, Mississippi Jake (K5HUW) relates a few bits of "skip news" from his area.

"On 4-2-60 worked HC1FS and HC1JW at 1:00 PM CST, both with signals over S9. On 4-9-60 worked LU4DOC and LU2KE. 4-18-60 worked LU3DCA and XE1GE. 4-21-60 heard PK2 breaking through. 4-26-60 worked CO2 DL, and the band opened to Florida for two hours; also opened to 9-land and Ø-land for almost two hours. 4-27-60 LU2FAD and worked LU2FCD. Heard a CX station in Uruguay but was unable to raise him. Had a very good opening during the contest also."

"We are now on two meters also, with a Tapetone Converter in front of the NC300. Antenna is a Telrex 15 element on 28' boom. Transmitter is homebrew, 6146. Tell the boys to look for me on two down here on the Gulf coast of Mississippi." *Push some of these DX signals up our way Jake, could use 'em. Consider the two meter gang alerted. They'll be a-listenin'.*

Canoga Park, California A 'shortie' from Denny Williams (K6UMM), also about DX.

"Had a short opening to South America on the 16th and 31st of March, but nothing like the opening we had on the 2nd of April."

On that day six was opened up by LU9MA, Gene, at 0800 PST, with good Q5, S7-8 signals. Was first to work him as everyone else was asleep. (*I'll bet that situation didn't last long.*) The band was open from 0800 until 1315 PST with only Argentina coming in around the L.A. area."

"Worked LU9MA, LU7BP, LU7MAZ, LU2DHP, LU2FAO, LU2FCD and LU1MBJ. Received a QSL from K7ALE and they had a fine opening to LU's on the same day." *Looks like we just don't live right, or else we should move to another location!*

Novelty, Ohio Paul Wolfe (K8III) lets slip a few words about contesting. "Thought I'd let you know what a good time I had in the April Contest. K8NDW, K8LEP, K8NJU and myself, set up a portable rig in Geauga county (*my old home county*) on top of a 1215 foot hill. Operation was in tents and power came from a 6 *kw* generator donated by W8DIG. (*Nice fella!*) When 8:00 PM came along we were all ready to start but the 6N2 transmitter would not load the antenna. *That's the way it goes at contest time.* A G-50 standby rig was thrown on and a few local QSO's were made. About 45 minutes after the contest started, we heard LU4DFN, LU9MA and other stations in South America calling CQ Contest (*where are those logs?*) but we didn't work them. All of this

Here is what you should be seeing in your mind's eye when you work Gerry (K5LMQ) or Jake (K5HUW) away down thar in Mississip.

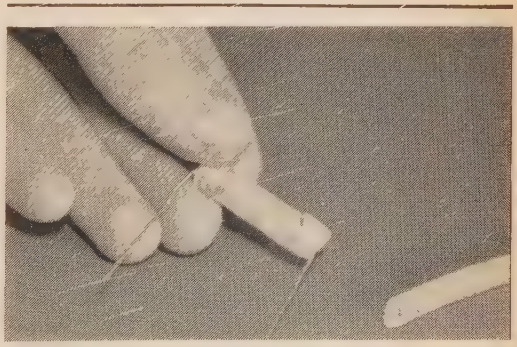
took place during the Saturday night aurora opening. Finally got the 6N2 operating and things started to roll. We lost a lot of time fixing the 6N2 and never did catch up with the boys in Michigan. We were surprised to work WA2AXA in Lockport, N.Y. on groundwave. Constant reception of W1MHL/1 for 24 hours straight, was also quite a surprise."

"Rig was 85 watts to 6N2, VFO control with HQ-140X receiver, Filter King Converter and a 4 element beam 23' high completed the set-up." *Very, very nice Paul. Glad to see someone using Geauga County to its best advantage.*

Word received from "The National Capital VHF Society" via W30TC, Bob, sez: "We at last have our cup to be donated to the first two meter ham working 48 states." *Congratulations, fellas! Real glad you didn't make it 50 states!*

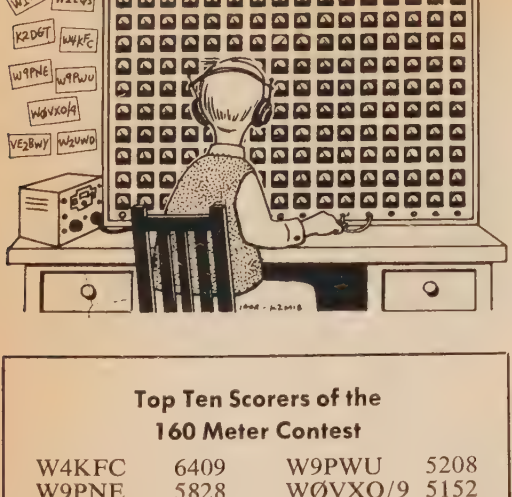
73, Sam W1FZJ

Ham Hints



Insulated Pigtail Fuses

In mobile equipment, the metal end caps of pigtail fuses tend to touch against bare wires or parts mounted nearby, short-out to ground and blow. Spiral spaghetti' slipped over the fuse body with ⅛" extending out over at either end will prevent this.



160 METER CONTEST RESULTS

Charles M. O'Brien, W2EQS
48 Prospect Avenue, Westwood, N. J.

Who said 160 is dead? Wow! What a contest! For an affair that was put on without too much notification and fanfare, it was a howling success. A total of *284 different stations from 34 States,* 4 Canadian provinces, British Virgin Islands and England took part to make this a most exciting and interesting brawl. Such activity packed into two 25 kc segments no one ever heard.

Next year?? Yes, but definitely. And, with more advance publicity. Practically every log received contained a comment about conducting it again.

The band was packed with CW signals. Don't know where our phone men went but it is presumed they took their XYLs or YLs out both Friday and Saturday nights. The A3 boys didn't stand a chance.

How many of you worked a brand new country for the first time in the person of VP2V/A who was none other than our old 160 meter stalwart Bob Denniston, WØNWX. The British Virgin Islands are a very tasty morsel on the high frequency DX bands but when such a spot shows up on 160 you really got yourself a nice hunk of rare stuff.

Where did the signals come from? Well, broken down by districts and other areas here is how the affair stacked up: First-23; Second-45; Third-11; Fourth-17; Fifth-4; Sixth-33; Seventh-18; Eighth-59; Ninth-43; Tenth-20; VE1-1; VE-34; VE-41; VE-72; VP2-1; G-2.

It is a shame that some of our States are not permitted the use 160. Those States that were on included: Rhode Island, Massachusetts, Connecticut, Vermont, New Jersey, New York, Pennsylvania, Maryland, Delaware, Virginia, Kentucky, Tennessee, South Carolina, North Carolina, New Mexico, Texas, Oklahoma, California, Utah, Idaho, Washington, Oregon, Montana, Ohio, Michigan, West Virginia, Illinois, Indiana, Nebraska, Colorado, Missouri, Minnesota, Kansas and Iowa. Quite a respectable mixture.

Comments

What did some of the boys have to say? Inveterate 160 meter DXer and owner of the most

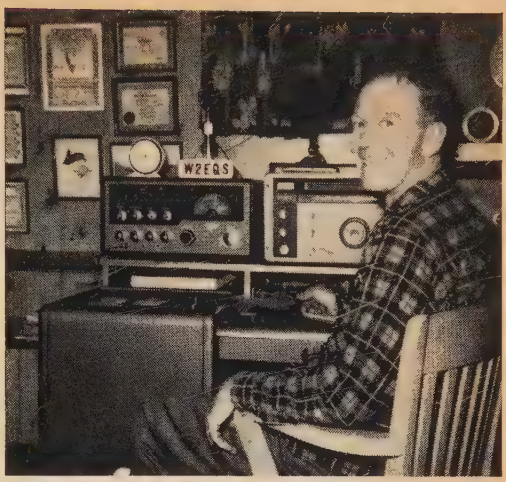
Top Ten Scorers of the 160 Meter Contest

W4KFC	6409	W9PWU	5208
W9PNE	5828	WØVXO/9	5152
W2EQS	5516	W2UWD	4833
K2DGT	5356	VE3BWY	4416
W1BB	5211	W2KFR	3500

	QSOs	Mult.	Score
Massachusetts			
W1BB	102	27	5211
W1AQE	77	19	2774
Rhode Island			
W1PPN	80	21	3255
Connecticut			
K1KSH	48	14	1204
W1WY	37	15	1035
New Jersey			
W2EQS	109	28	5516
W2KFR	78	25	3500
W2HUG	41	15	1050
New York			
K2DGT	116	26	5356
W2UWD	100	27	4833
WA2GWF	50	17	1445
W2WZ	25	12	528
W2EB	2	2	8
Maryland			
W3EIS	56	23	2530
Pennsylvania			
W3MFW	66	21	2667
Kentucky			
W4OMW	57	20	2180
Virginia			
W4KFC	114	29	6409
W4KMS	33	14	868
South Carolina			
K4WCZ	51	18	1674
North Carolina			
K4MHS	39	16	1184
Texas			
W5KWL	43	19	1596
New Mexico			
W5DWB	54	20	2120
California			
K6HXT	68	23	2645
W6LN	46	17	1224
W6YC	34	11	550
K6RAU	30	10	450
WA6CDR	28	8	320
K6SDR	24	8	272
W6JAI	5	1	5
Idaho			
K7BWV	28	13	539
K7HDB	32	10	530
W7AYN	19	6	168
Washington			
W7ZVY/7	38	13	756
K7APJ	18	6	174
Utah			
W7QDJ	45	17	1394
Ohio			
K8HBR	76	24	3216
W8QHW	62	23	2553
W8KJK	58	17	1632
W8GDQ	13	12	300
W8VDF	8	8	120
K8OPK	10	7	112
K8IIO	6	4	36
Michigan			
W8GIY	53	20	1920
K8HUT	45	18	1836
Illinois			
W9PNE	101	31	5828
W9PWU	103	28	5208
WØVXO/9	104	28	5152
W9NPC	73	26	3432
W9BMV	40	20	1500
K9JMA	25	13	572
Minnesota			
WØRHI	18	8	280
Missouri			
KØUDQ	20	11	660
Nebraska			
WØYFR	35	18	1242
Colorado			
WØCDP	65	27	3375
Ontario			
VE3BWY	93	24	4416
VE3DU	33	14	910
VE3AEJ	15	9	261
Manitoba			
VE4SX	1	1	2
British Columbia			
VE7EH	28	9	495
British Virgin Islands			
VP2VA*	14	35	490

*WØNWX operator.

Vic Clark, W4KFC, winner and consistent high scorer.



Charley O. Brien, W2EQS, Westwood, N. J., prominent 160 meter DXer with Victory smile as he hits the CQ 160 CW Contest for high New Jersey score. He adds one more country to his 30 worked/ 5 continent score. (Photo by W1BB)

familiar call on the band is W1BB, Stew Perry. And, this is what he had to say: "I want to compliment you on the CW Contest. It went off very nicely indeed and I think was a lot of fun for all. It was about right in every respect. There were a nice bunch of fellows on and the operating techniques were good. Gave all hands good chance to test out antenna and equipment under real 'test' conditions."

"Let's have another and better publicity. I was told of this one only 2 days before," says W1AQE. From W2HUG, "Very fb contest and hope it is continued next year. Was surprised my 44 foot vertical antenna worked out at all." W2KFR chirped in with, "Had wonderful time. Lots of good operators. Looking forward to next time." WA2GWF noted, "I didnt' expect to set any records in this contest. Just stuck around because I enjoy contests and wanted to do my bit to promote 160 meter operation. I sincerely hope this activity becomes a yearly event." Down south a bit, W4OMW had this to say, "Had lots of fun and worked 6 new States."

Old time contest veteran, W4KFC, the highest scoring station in the nation, shared the view of many others in stating, "Hope it will become an annual affair." Vic offered some fine suggestions re changes in scoring which are being given very serious consideration. And this from K4WCZ, "It certainly was quite a feat getting al those signals into this small segment of the frequency spectrum with such gratifying results." And, a newcomer to contests, K4MHS, offered this—"This was my first contest of any kind and I sure did enjoy it." Reporting from the southwest, W5KWL, chipped in with, "Lots of fun. Let's do it again."

And now out to the far west. W6JAI, "Let's have another contest next year." And, still following along the same trend of thought, K6SDR says, "Sure enjoyed the fun during the contest." K6HXT, top scorer among the 6s, is a real eager-beaver. "It was lots of fun. Let's have more; maybe 2 week-ends earlier in the year spaced a month apart." And, from another prominent W6, W6LN, "Would like to see more articles on 160; especially antennas. It proves all you need is a little drum beating to get more interest for 160." Up in the northwest W7XVY/7 opined, "I really enjoyed this contest. Hope it is continued next winter. Don't know how those 6s worked all those 4s and 9s." W7QDJ, an old timer on the band; "Great idea this contest."

From K8HBR, leading station in the 8th district, "Sure enjoyed it. Hope you make this an annual affair. Only fly in the ointment is the 50

W1BB in 1920 with one of the very first CW/ Phone/ICW transmitters.

Latest photo of W1BB 160 meter DX station equipment. 160 meter gear is in the RH corner.

watt power limit we're restricted to. A QRP multiplier should be allowed for the 50 watt states as we ran into stiff competition from the 200 watters" (Al, please note the scores of W9PNE and W9PWU, also 50 watters). K8HO says, Entered so that FCC will know of one more amateur that hopes for some relief and return of the 160 meter band to the amateur from whom it was taken." W8QHW enjoyed himself immensely and requests, "Let's have another one soon!" W8KJK also wants the FCC to take note, "Let's have these more often. Let's get FCC to expand band a little." Following in the same vein is K8OPK, "Please push for more frequencies on 160." "I had a lot of fun in contest. Will be looking for more," says K8HUT.

From the mid-west come these comments. W9BMV—"Nice contest. Lots of fun!" From old-timer W9PNE, "I was pleased with the big turnout of stations for the contest and am looking forward to the next one." Now, here's an OM who is really all fired up and excited—"Enjoyed the contest immensely and hope you continue it—about once a week would be fine!"—W9PWU. (Wonder what the XYLs might say about that???). W9NPC, as many others is "Looking forward to another 160 contest."

VE3BWY, Ham Whyte, is a minister and the greatest chuckle of all was had in opening his letter which began, "Brethers . . . ." Ham has an excellent point. He says, "I am in favor of trying to get a friend to come on and work a few of the boys but I am not in favor of such an invited station working only one person and then go QRT."

VE3DU, "Enjoyed the party very much. Sorry didn't get going on first evening. I have never heard so many CW stations on 160." Interesting comments from VE3AEJ, "The QRM was just as heavy as during a DX Contest but it was worth battling in order to hear so much activity on a much neglected band. I hope there will be other tests like it but it is unfortunate that it takes a contest to activate the band." And here's one we'd all love to have heard, VE4SX —"Sorry I wasn't able to contact more of the boys (so are we, Ralph). I spent all Saturday and Sunday nights calling them. Most had good signals. But, WOCDP was the only one who would answer me. I hope I can do better next year."

And so, gang, that's the story of the First Annual 160 Meter CW Contest. Wonder how many of the old timers remember when the band extended from 1715 to 2000 *kc*. From 1715 to 1800 was exclusively CW. And, there was no Loran in those days to contend with. Prior to WWII the band was jammed 24 hours a day. (At different times the band limits were changed to read 1750-2000 *kc* and 1800-2050 *kc*.) Where, oh where, are the multitudes who once made 160 their home? Gosh, if only the Loran spectrum could be changed!!!

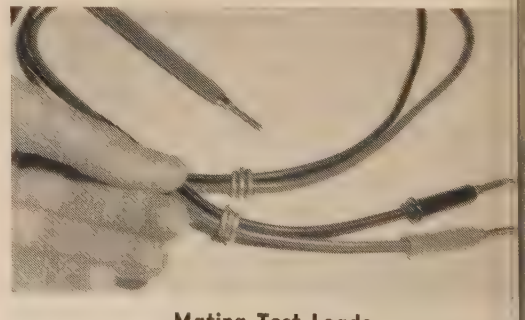
And, now the results. Congratulations to the winners. To those who didn't quite make it remember that next year we'll have an even bigger and better contest. The highest scoring station in each state and Canadian province shall be receiving, shortly, a certificate of merit. Next year we hope to have a gold cup or two. So, let's get those antennas tuned and everything put in readiness for the Second Annual 160 Meter CW Contest to be conducted some time in January or February. We'll give you pull-enty of advance notification. In the meantime, keep active on the band. Don't hold off till contest time. There are many interesting contacts to be had and there are crackerjack ops behind many of those keys.

The following is a tabulation of the participants in the 160 meter contest held March 11, 12 and 13. The first column is the number of contacts, second is the multiplier and the last column is the final score. Rules and method of determining multiplier score appeared in *CQ* for February, page 108.

Ham Hints

Holder For Penlight

A penlight is a good source of illumination when you have a soldering job to do in a dark forest of wires and parts. But how can you hold the light, soldering iron and solder with only two hands with which to work? To position the beam of light right where you want it, put the penlight in the jaws of a large paper clamp and stand it up on the bench as shown.



Mating Test Leads

When you store a pair of test leads in a drawer with other cords or hang several pairs up together on the wall, mates soon become separated and you have to untangle and sort out the whole mess. Keep leads together with short pieces of wire solder. This makes them easier to handle, too.

Results Of The 4th Annual SSB DX Contest

January 30-31, 1960

Irv and Dorothy Strauber, K2HEA/K2MGE
12 Elm Street
Lynbrook, New York

Station	Prefixes	Contacts	Total
CN8JF	116	751	87,116
CO2ZS	117	726	84,942
TI2HP	126	632	79,632
HB9TL	119	635	75,565
GI3CWY	116	635	73,660
W2SKE/2	106	509	53,954
KL7CDF	92	529	48,668
ON4DM	103	365	37,595
YV1CC	83	422	35,026
KZ5WZ	77	450	34,650
DJ1BZ	94	360	33,840
VP7BI	79	426	33,654
W9EWC	107	312	33,384
I1CWX	111	296	32,856
SM6BSK	104	313	32,552
OQ5IE	103	310	31,930
LA6VC	93	323	30,039
KH6DLF	79	353	27,887
W6ONP	79	342	27,018
SM6SA	87	308	26,796
ZS5JY	69	386	26,634
TG9PS	68	385	26,180
KG4AP	58	429	24,882
KA2CB	74	318	23,532
XE1SN	71	300	21,300
W4HXC	80	266	21,280
K5IIN	67	306	20,502
W4JUR	94	209	19,646
KP4ATU	47	374	17,578
K5DGI	70	250	17,500
KH6BYZ	62	274	16,988
G3WW	62	266	16,492
SVØWV	85	198	16,830
W3CJI	91	177	16,107
VE3BJO	78	184	14,352
W2HMJ	80	178	14,240
DL4GE	68	207	14,076
W8JGU	97	144	13,968
W8YIN	68	203	13,804
DL1AU	77	166	12,782
OK1FF	79	156	12,324
SM5AQV	78	156	12,168
PAØFB	73	164	11,972
W1BIH	86	137	11,782
ET2US	67	175	11,725
K2MGE	79	144	11,376
W7DLR	53	213	11,289
K4ZJF	62	181	11,222
YV6BR	55	203	11,165
MP4BBW	82	135	11,070
KA2NY	55	200	11,000
OH3TH	78	141	10,998
W2GNQ	75	146	10,950
W2ZKQ	81	129	10,449

First place winner, Jack, CN8JF/W8UWT, (left) being presented with his first place certificate by Col. Boyd, 1975 AACS Commander.

The following stations achieved totals of 10,000 points or less:

VQ4ERR, VE3UOT, OZ5KQ, K5PXU, W3EQF, DJ2XP, LA5HE, DL6VM, VE3ES, KA2DE, K4VQO/9, KØTAJ, WØMCX, DL4GX, DL1UX, KG1FK, ZL3AB, HI8GA, OK2AG, ON4SZ, VE2AZN, VE2BK, W8BMX, OK1VE, VE2JD, DL1VR, CX2AY, K8RCQ, DL4XN, OK2RZ, JA2JW, W9YRU, XE1AE, OK7HZ, YI, SM5BFR, W5EDX, HB9J, VP6WD, ZS6L, OY7ML, VS6EK, W6NJU, W5BZV, W2CGJ, W6FKZ, VE3GDW, W6PIF, W4VKB, W8VSJ, W3ML, W8BKO, W9QNO, W9WWJ, W2QKJ, W9ABA, W6AUT, W4EEO, W4EEU, K8CFU, K4DSW, and W7UPF.

Our thanks to the many other stations who submitted check logs.

The 4th Annual CQ SSB DX Contest attracted hundreds of SSB stations, some of them pioneer SSB operators and others, newcomers to this fastest growing mode of amateur communication. With good conditions prevailing over the weekend of Jan. 30-31, this 24 hour contest left a pleasant memory in the minds of those who participated and an eagerness to do even better next year. The scores were based on single point values with one point given for each contact and for each different prefix. There were no multipliers so the scores, as listed, were quite impressive in their increase over last year's participation.

The winner and new champion is Jack, CN8JF, who headed the list with a grand score of 87,116 points. Operating from his shack in Sidi Slimane, Morocco, Jack bettered the score of last year's winner, Peter, HB9IE, by 30,000 points, attesting to the rapid increase in SSB stations all over the world. This adds another feather to Jack's cap, inasmuch as he won third place in the "all band single operator" category in the CQ World Wide DX Phone Contest. A shining Silver Cup is being suitably engraved for Jack to be presented to him upon his return to the States in August.

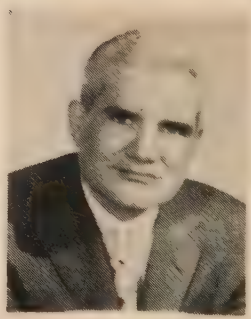
Close on Jack's heels was John, CO2ZS. John's call is new to these SSB pages and to the SSB contest totals. Here is a fellow to watch out for in next year's contest when, in his first try, he places second.

Our perennial SSB contestant, Humberto, TI2HP, jumped two places over his 1958 contest position to wind up third. Last year, you'll recall, Humberto operated from the Cocos Islands as TI9SB and, despite difficult conditions, ended up among the top ten winners. Jack, HB9TL, again follows Humberto, as he did in last year's contest. Jack mentioned that

Ted, GI3CWY and XYL

Butch, W9EWC with Empty, ZS6KD

Lot, DJ1BZ



Bill, W2SKE

John, CO2ZS

Don, KL7CDF

Humberto, T12HP

Wally, KZ5WZ

Joe, YV1CS

the contest was lots of fun but the band folded up for five hours during which he caught up on his sleep. The same conditions applied for Ted, GI3CWY whose first contest this was but who obviously caught on very quickly to occupy the No. 5 spot. Ted bemoaned the lack of a good opening to the Far East and Pacific area but, nevertheless for a newcomer, Ted racked up a terrific score.

Still the top W SSB contest man, Bill, W2SKE/2, proved that being on this side of the ocean is not the handicap most people seem to think. Bill worked 509 contacts, proving that W stations can do themselves proud if they do not concentrate only on trying to work new countries. Too many W/K stations allowed themselves to be scared off by the higher scores of the DX stations and stopped trying halfway through the contest.

Don, KL7CDF more than doubled his last year's score while Wally, KZ5WZ, who has participated in all the SSB Contests, went from 17th place in 1958 to 13th in 1959 to 8th place in 1960. At this rate, we expect to find Wally right up at the top next year.

Certificates have already been mailed to the top twenty five scores. We hope that, next year, we have the pleasure of sending one to you.

In looking back and in analyzing the contest scores, we find that few stations utilized the lower frequencies with their potential contact values. Bill, W2SKE/2, was one of the rare exceptions and this certainly is reflected in his score. In contrast to the number of W stations, there are only a limited number of DX stations to work. Once their calls have been entered in the log, the good operator fires up on 40 and 80 and joins roundtable after roundtable to add to his number of contacts. If you enter a contest of this type just to work new countries, fine But, if you'd like to see your call among the top 25, work the locals in your own country and see your total rise.

A number of would-be DX contestants, unfortunately, did not get notice of the contest in time to operate. We hope to change this next year by sending an announcement and the rules well in advance direct to each DX SSB station.

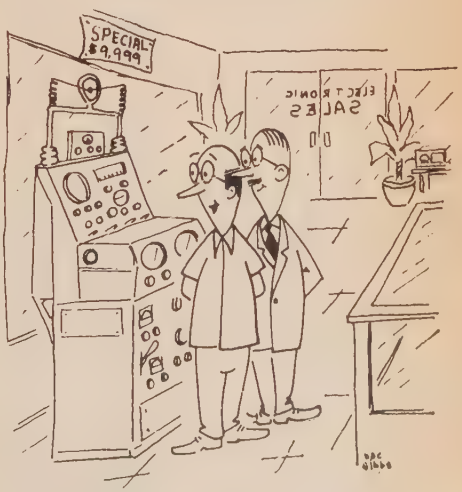
Prefixes

Many comments were received this year regarding the confusion over what constitutes a prefix. For the benefit of those inetrested in the SSB-WPX award offered by *CQ* and in future SSB contests, we should like to quote from the *CQ* WPX regulations: A "prefix" is 1. The two or three letter/numeral combination which forms the first part of any amateur call. 2. Any difference in the numbering, lettering or order of same shall constitute a "separate" prefix. The following would be considered all *different:* W2, K2, WA2, 5A1, 5A2, DJ1, DL1. In a prefix, only the first three (or two) letter/numeral combination will be counted. A call like FKS8ZZ (now obsolete) would count as FK8, HCC8 as HC8. 4. Should a station be worked such as VS6AE/CR9, it would count as CR9; KH6AFQ/K4 as K4." We hope this clarifies the matter and you now understand what constitutes a prefix as used in scoring these contests.

Jack, HB9TL

Mickey, W8YIN, drew up a thorough critique of the contest, part of which we'd like to share with you. We agree with him that there should be some incentive for low power operators and are considering a multiplier for stations using less than 150 watts. We also feel that single operators and multi-operator stations should be placed in separate categories. Mickey also pointed out that awards should be given the top W/VE stations as well as top DX stations. We are already planning next year's contest (even have a tentative date, Jan. 27-28!) so if you have any suggestions for changes in the rules, be sure to let us know.

We wish to thank all the SSB stations who participated in this 4th Annual Contest and made it such a great event and look forward to receiving your log and many more next year. ■



"You bet I'll take it. What is it?"

sideband sideband sideband

SIDEBAND

Irv and Dorothy Strauber, K2HEA/K2MGE
12 Elm Street, Lynbrook, New York

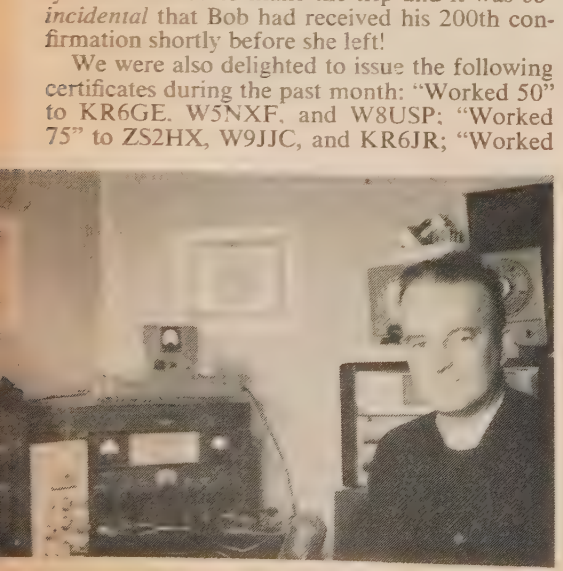
SSB DX HONOR ROLL

TI2HP	208	HB9IE	152
TI2RC	207	HB9TL	151
W6UOU	206	4X4DK	150
W8EAP	200	ON4DM	150
VQ4ERR	199	W7VEU	150
W4IYC	199	PY4TK	150
W8PQQ	195	WØCVU	150
W2JXH	190	W2TP	150
W6PXH	186	W2VZV	150
WØQVZ	176	K2HEA	145
W8YBZ	175	W8YIN	145
W3SW	175	W5RHW	140
W6RKP	169	K2FW	139
W6BAF	167	W1GR	137
K2MGE	167	W1OOS	130
TG9AD	166	K6ZXW	130
ZL3IA	165	W9QNO	129
W6WNE	163	K6LMS	129
VE3MR	162	K6LGF	129
VK3AHO	160	W5KFT	128
K6GMA	160	KØCTL	125
K9EAB	158	W2CFT	124
WØFUH	156	W1EQ	123
W3MAC	152	W5DA	123
MP4BBW	152	W1TYQ	122

It was but a few years ago that Ted, W6UOU, and Harry, W2JXH, battled it out for the honor of being the first station to work *100* countries. Just look at our Honor Roll now! Certificates #3 and #4 have already been awarded to Doc, W8EAP, and to Bob, TI2RC, for *200* confirmations on two-way sideband. From the way things are shaping up, at least five more stations will be eligible by next month.

TI2RC had his lovely wife, Ann, who was vacationing in New York, bring his QSL cards with her. We had the double pleasure of issuing Certificate #4 to Bob and of chatting with his understanding wife. She assured us that she really had intended to make the trip and it was *coincidental* that Bob had received his 200th confirmation shortly before she left!

We were also delighted to issue the following certificates during the past month: "Worked 50" to KR6GE, W5NXF, and W8USP; "Worked 75" to ZS2HX, W9JJC, and KR6JR; "Worked 100" to W2HXG, W3ICQ, W8JDV, W8ACT, K2JXY, and K6HFZ; and the "Worked 150" sticker to W3MAC. Congratulations to one and all!



Bill of Rights

One of the blessings of our democracy is the right of free speech; it is one of the cornerstones on which our country was built and one which was established with sacrifice and bloodshed. It is wonderful to know that even on the ham bands it is practiced, sometimes with a fervor that would do credit to Patrick Henry. The other night we overheard a disciple of free speech giving forth thusly: "I've been on the air for "umpty-ump" years and I'm sick and tired of having guys telling me that this is wrong with my signal and what is wrong with my audio and that I'm not operating the way the book says. I'm going to operate as I please and nobody is going to tell me how my station should be run. I've been a ham for longer than these guys have been able to read and I know how to operate."

We applaud this evidence of rugged individualism as an evidence of our ability to speak our mind, but we wonder if some of us are carrying our right to do as we please just a bit too far. We have heard reports being given on signals which were not flattering to the offending station, and to his credit, the offender was usually grateful for the opportunity to learn that he was having trouble and for the help being given him. Too many times, though, we have made aware of the reluctance to accept the opinions of other stations, expressed in the helpful traditions of ham radio, "Who is he to tell *me* I've got a lousy signal?" "What kind of receiver is *he* using?"

We know of no hobby, and we have run through quite a few, that has the same camaraderie and willingness to help, as does ham radio. Nobody has a flat tire on the air that someone will be only too willing to stop and help. The fact that we can exercise our rights to speak and do as we please does not give us the right to do so to the detriment of others; if we are operating so as to cause others to have difficulties, it is our duty to correct our manners. The right to operate carries with it the obligation to do so according to regulations. The law is quite specific, to wit; 'the amateur transmitter shall not be modulated to the extent that interfering spurious radiation occurs'; 'each amateur station

Jim, EI4Q, 1st EI to achieve WAZ, DXCC, WAS, and EDX, is also EI Bureau Mgr. and salmon-trout fisherman extraordinary.

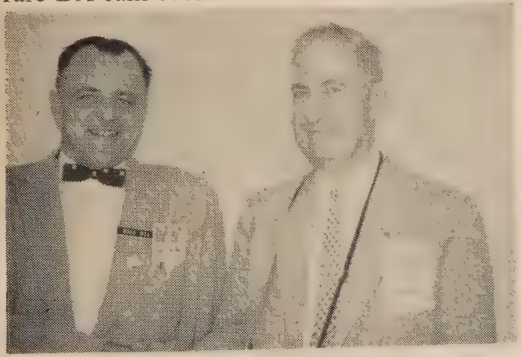
shall be operated in accordance with good engineering and good amateur practice'; 'no licensed radio operator shall willfully or maliciously interfere with or cause interference to any radio commmunication or signal'; or the one regulation consistently ignored by everybody, 'the transmitting equipment of a radio station in this service shall be adjusted in such manner as to produce the minimum radiation necessary to carry out the communications desired'. Make much sense to use a kilowatt to talk across town? If you have read Part 12 of the FCC Law pertaining to the Amateur Radio Service, you will find other injunctures that limit our "rights" for the good of everyone.

The fellow that tells you that your signal is not up to snuff is doing so in the true amateur spirit. One of the reasons we have been free of restricting regulations is that we have been policing ourselves for these many years with some measure of success. One of the surest ways to burden ourselves with more regulation is to ignore the few that we do have. It is irksome to be criticised for something we are or are not doing, but it seems to us that it is far better to have one of the "family" do it than to have an "outsider" step in and do it for us. If you are offending with a poor signal or with incorrect operating practices and it is pointed out to you, take a minute out to check; you could be wrong!

Operate your station as you would like to see the other fellow operate his!

W4IMP SSB RIG

Thanks to Joe, W4IMP, and Myron, W4IYC, there should be some new countries on SSB before long. Joe has made several improvements in his "Imp" SSB rig, adding a 6C4 triode 2nd audio, a 6DQ5 final amplifier, and an OA2 VR tube for the screen of the final. The package, measuring less than ½ cubic foot in volume, also includes a full wave voltage doubling bridge circuit with silicon diodes. Crystal switching has been added in place of the VXO, and this little box will put a 100 watt PEP input signal on 20 meters! Myron will take charge of shipping the rig to spots that are not as yet on SSB so keep your ears tuned to the 20 meter band for some rare DX calls soon.



Bill, W3SS, and Ken, W8SS, meet for the first time in Dayton.

Trav, K9EBE, and Dr. Robert Beam, W9BGZ, pause for a chat at the Dayton Hamvention.

Dayton

The Dayton Hamvention on May 6-7, as always, was a really terrific affair. The Sideband Dinner was attended by almost 200 SSBers from the area as well as some from far off places like New York and California. We had the pleasure of meeting and chatting with Bill Halligan, W9AC; Bill Eitel, W6UF and his charming wife; Bill Orr, W6SAI/3A2AF, who was the main speaker at the Banquet, and his lovely wife; and so many more that our note book is full to overflowing with names and calls so familiar to sidebanders around the country.

Ed, W8OVG, and his capable assistant, Bob, W8CUJ, together with their committeemen, put on a terrific show and the weekend is one that will long be remembered by all who attended.

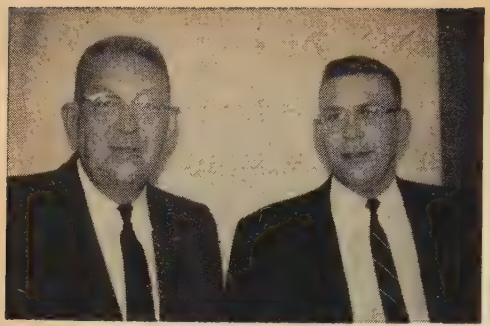
Not the least among the items on the program was the SSB Forum. Dr. Robert E. Beam, W9BGZ, in charge of R & D at the Hallicrafter Company, talked on the "Generation of Single Sideband Signals" and Al Pichitino, WØEDX, Chief Engineer of the E. F. Johnson Company, explained the operation and adjustment of linear amplifiers. Your editor was pleased to act as moderator and we can report that only the urgency of the luncheon call brought an end to a very fine program.

We are already making plans to attend next year's Dayton Hamvention; the spirit of the DARA group is really wonderful and we were inspired by their efforts and enjoyed every minute of the convention.

Power Measurements

One of the aspects of Single sideband that leads to a great deal of confusion is the measurement of input and output power. One of the best expositions of this subject was a recent information letter sent out by the Collins Radio Company which we think is worthy of mention. We have extracted the portions that are applicable to any equipment and it is hoped that it will help clear up any confusion that might exist in your mind as to why your *rf* output meter does not seem to be reading the amount of output power your rig is capable of providing.

If you have watched an *rf* output meter, you



Bud, W9OGA, and Bill, W9TRP, father and son, part of the famous Runzel family of hams in Chicago.

will note that the readings seem to be far below what you have been led to believe that your rig is capable of. Your 1 *kw* or 2 *kw pep* linear, or your 100 watt *pep* exciter, does not show more than 150 to 200 watts, or less, depending on the input power, and you know full well that you have, or should have, more output than that! After all, the ads say so! The immediate reaction is that there is something wrong with the rig, the antenna, or the manufacturer's advertising department. Actually, it is nothing of the sort!

To begin with, your plate current meter is highly damped in accordance with the current interpretations of the FCC regulations. This means that it does not respond to short voice peaks; the ones which push that current meter needle up the scale. Damping keeps the needle from flying all over the scale. If there were no damping, the meter would indicate inputs of over 1 *kw* during speech and this would be illegal by FCC definition. Because of this damping action on voice peaks, different voices will cause different degrees of needle deflection. A low pitched voice will generally "talk up" higher than a higher pitched voice. However, don't worry about it if you can't talk your meter up as high as the next guy; if you are properly loaded up to the correct *dc* input of your final tube, your peaks are going right up there where they belong! If you have some form of ALC, it is riding gain for you and everything is working quite normally.

To better understand the apparent loss of output power, recalling some of the characteristics of the human voice will help. An oscilloscope pattern of speech shows random high peaks and an abundance of low level energy. Research by the Bell Telephone Company and the Army Signal Corps has shown that the peak to average power ratio of the human voice is between 13 and 15 *db*. Compression, such as some form of ALC, will reduce this peak to average ratio to about 10 *db*. This is an average figure and will vary from voice to voice.

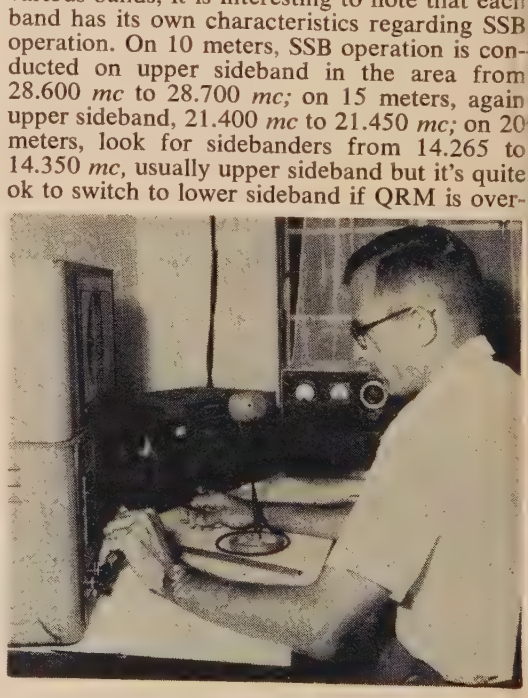
To see how this peak to average ratio will affect the performance of a SSB transmitter, assume a peak plate input of 2 *kw*. If the amplifier efficiency is 60%, there will be output power peaks of 1200 watts. But since the *rf* wattmeter indicates average power only, a voice with a 10 *db* peak to average ratio will indicate only 120 watts on the wattmeter.

In making power output tests, use continuous carrier conditions only. CW output can be measured by closing the key and increasing the carrier until 1 *kw* input is indicated. Output can be measured by using the exciter on CW or SSB with single tone input and the linear in SSB. Increase CW drive until grid current just starts to show on the linear. Read the input and the output fast and back off on the drive to avoid trouble as most 2 *kw* power supplies are not able to handle 2 *kw* inputs continuously. These tests should be made into a dummy load to be legal. The power outputs observed in these tests should be about 600 watts on CW and between 1000 and 1200 watts on SSB, assuming a 2 *kw pep* linear, proportionally less with less input power. If output of this magnitude is obtained under steady tone conditions, peak outputs slightly greater will be realized under voice conditions. Your *rf* output meter, if working properly, will indicate about 200 watts average power depending on your own voice characteristics.

So resist the temptation to turn your audio gain up to make the output meter read higher—the only thing you will succeed in doing is spreading your signal out—not up! It's a sure way to make certain that the whole band knows that you are on the air!

SSB Activity—Where To Find It

While listening for SSB activity across the various bands, it is interesting to note that each band has its own characteristics regarding SSB operation. On 10 meters, SSB operation is conducted on upper sideband in the area from 28.600 *mc* to 28.700 *mc;* on 15 meters, again upper sideband, 21.400 *mc* to 21.450 *mc;* on 20 meters, look for sidebanders from 14.265 to 14.350 *mc*, usually upper sideband but it's quite ok to switch to lower sideband if QRM is over-



Bert, ZS3ES, who will soon be operating from VE-land.

powering. Now on 40 meters, sideband activity is greatest from 7204 to 7215, *lower* sideband, but higher on 40 meters around 7290, sidebanders use *upper* sideband. 75 meters is laced throughout the band from 3805 to 3999 with regional and net activity dictating the frequency. All SSB operation on 75 meters is on lower sideband. We'd very much like to hear from the various groups operating on 75 meters, indicating which regions they represent and on which frequency they are active.

Sideband Around The World

We (and hundreds of others) were delighted to welcome Jo, CR6CA, to SSB at last. Two hours after he received his HT32A, Jo was on the air with a terrific signal on the East Coast. The next evening, with the HT33A hooked up, he worked for four hours straight, dispensing one contact after another. When he finally went QRT at 0245 (his time) there were still hundreds calling for their first CR6 contact. Knowing Jo's enthusiasm for SSB, we imagine that, by this time, you all have Angola confirmed on two-way SSB. . . . Looks like VQ7-and VQ9-lands will have many visitors this coming summer. Robby, VQ4ERR, writes us that VQ9TED is hoping to sail among the islands in the Indian Ocean and will operate SSB ashore *if separate country* status is granted, while Lee, WØAIW, is planning to visit other islands in the same area if the same conditions are met. . . . Their many friends will be happy to learn that Richard, G3WW, and XYL will visit the States in August and September. Richard is an attorney and will attend the American Bar Association Conference in Washington, D. C. After August 23, he may be reached at the home of his daughter, Mrs. R. Metterhauser, 39 Park Place, Princeton, N. J. . . . Terry, ex-VQ5FS, is now home on vacation in Eire operating with a new call, EI9G, rock bound on 14.306 mcs. . . . Southwest Africa has a new operator on SSB with ZS3AD taking over the 10A and pair of 807's formerly used by ZS3ES. . . . Since he was not permitted to operate from either YW1 or EP, Jiri, OK7HZ, headed for India. Jiri issues his own QSIs, forwards them to the CAV in Prague, from where they are mailed. Only Jiri has his logs so don't bother to write the CAV about delinquent cards. . . . We trust that Joss, ZS6L, is now fully recovered from the operation that kept him off the air for about a month; a speedy convalescence to you, Joss. . . . We can sympathize with Mary, W6VWL, who had planned a week's operation from EA6AR on Majorca during her European vacation. Two days after she put the rig on the air, it developed gremlins and Mary regretfully had to leave the island without contacting many DXers on the lookout for her. . . . Paul, ex-VQ4EO, now 9G1CX, is on the DX trail again, this time from FF4, 7G1, ZD1, and ZD3. At least, those were his plans for early July; hope all goes well because Paul did an extraordinary job two years ago of dispensing rare African contacts on SSB.

We hope you'll have a most enjoyable summer and look forward to contacting many of you /P.

Forms Available For Country Listing

Because of the great variation in the submission of lists and cards for the awards, we now have available mimeographed sheets for listing your countries. Send a stamped, self-addressed envelope to *our home address* listed on the column head and we'll be delighted to send you these sheets, making it easier for you to enter your confirmations and for us to check them.

Band Hopping

Dayton provided the memory book with many entries—Bob, W8DPW, the Banquet MC, enthralled by the many wonderful prizes to be given away after the Dinner, forgot to introduce the speaker, Bill, W6SAI, and had to be reminded. . . . Bill, who spoke delightfully about his sojourn on the French Riviera and the wonderful time operating 3A2AF, amply illustrating his talk with excellent color slides. . . . Jim, KØSGY, and Brad, KØHDX, Trav, K9EBE, and Bud, W9QVA, who were such great hosts. . . . Andy, WØLTE, whose ready wit and charm made a visit to his exhibit a high spot . . . the *CQ* brass in shirtsleeves, making with the subscriptions. Cary, Barry, K2IEG, and Harold were in there pitching all day . . . the *CQ* staff were there in force; Urb, W2DEC; Sam, W1FZJ; George, W3ASK; and Byron, KØWMR; all were forum speakers. . . . Bill, W8SVI, program chairman, was everywhere . . . Bob, W8BKO; Floyd, W9ZVT; Bill, W3SS; Cheever, W8LJ; Gus, K9EBA, the inveterate convention goer; Gibby, W8IJ; Glenn, K9USB; Lou, W2CLD; Morris, W2ARW; Bill, K8KEC; all the many friends we have made on the air were there having a wonderful time.

Wink, WØCBZ, spends what little time he has away from the rig in his darkroom, turning out prints which have been accepted by many salons. Wonder how many SSBers make photography a second hobby?. . . . Jerry, W2ZGA, with the distaff side, Aileen, W2LHK, vacationing in Florida, had the opportunity to get on the air to talk about the new computer he is working on. Not only does it correlate weather conditions for aircraft but it will also work rare DX and send a QSL card by slow scan TV! . . . Fred, W2IWC, now /9, finally jumped aboard the sideband wagon with a KWM-2. . . . Ask Sam, W2BKU, about the golf driving range that wasn't there! . . . When Fred, W4CF, heard strange noises on 14.353 one evening, rotary beams at K4AJ, K9EBA, WØEOI, K7KVG, K7HQS, W7FZA, K2EOR, and K2HEA began spinning until we pinpointed the source to everyone's satisfaction. Bob, Gus, Mort, Howard, Ken, Dick, and Tif, in that order, had the point of origin located in a matter of minutes! And they worry about security in the event of reciprocity! Only the advent of Lou, PY2CP, on the frequency kept us from finding the street. . . . Evan, WØQLX, of Collins, has a watchmaker's license. If you want to know what makes the "S" line "tick", ask Evan. . . . Gene, W6DQH, made good use of SSB to keep in touch with his glamorous wife, Gloria, a TV actress, when she visited New York recently. Most of the conversation was about the three dogs, five cats, the Mynah bird, etc., and their two charming little daughters kept Mommy up to date on local happenings. . . . Jack, W8JDV, is constantly honeycombing the country for any information on and examples of Grebe equipment. Jack just returned from a 2 week trip through Penn., N.Y., N.J., Maryland, and Wash., D.C., and after a short stay at home, headed for Cedar Rapids and Springfield, Ill. to visit his son and three grandsons. . . . Dick, W8DJP, has had the same call since 1930 but had never worked phone till he got on SSB in 1958. . . . That was a wonderful project that Uncle Dave originated for May Day—"Operation Goodwill" with sidebanders exchanging hundreds of "Freedom Messages" with operators throughout the world. . . . Ed, K8RTW, discovered SSB in Dec. 1959 and worked 103 countries in 3 months; you've never heard a more enthusiastic exponent of the art. . . . Wel-

[*Continued on page 106*]

PROPAGATION

George Jacobs, W3ASK
11307 Clara St., Silver Spring, Md.

During the summer months daytime MUFs are considerably lower, and nighttime MUFs considerably higher than at any other time of the year. This results in a noticeable reduction in 10 meter openings during July and August. During these months the 15 meter band is expected to be the optimum band for daytime DX and it will remain open later into the evening than during the winter and spring months. Improved propagation conditions to most parts of the world are expected on 20 meters from the late afternoon hours through the hours of darkness until sunrise. This band should be the optimum band for DX during the hours of darkness. Atmospheric noise reaches a peak intensity during the summer months and this is expected to result in generally poorer DX conditions on 40, 80 and 160 meters. Sporadic E propagation reaches a peak during July and August, and almost daily short-skip openings up to distances of about 1300 miles are expected on the 20, 15 and 10 meter bands, with a few openings also possible on 6 meters.

Continuing with the "new look" which was introduced in May, this month's column contains special DX Propagation Charts for July and August, 1960. Next month's column will feature a special two-month Short-Skip Propagation Chart.

Last Minute Forecast

At the present stage of the propagation art it is not possible to pin-point the exact days of the month on which particular circuits may open. As part of the "new look," however, an attempt is being made to take a step towards such a forecast. The probability indices shown in the Propagation Charts, together with the following *circuit quality figures* and last minute forecast of general propagation conditions expected for each day during the month of July, may make it possible to relate band openings with specific days of the month . . . at least to some degree.

Probability Indices	Above Normal Conditions*	Normal Conditions**	Slightly Disturbed***	Moderately Disturbed****
0	D	E	E	E
1	C	D-E	E	E
2	B	C-D	D	E
3	A	B-C	C	D
4	A	A	B	C
5	A	A	A	B

A—Excellent circuit, strong steady signals.
B—Good circuit, moderately strong signals, little fading and noise.
C—Fair circuit, weak to moderately strong signals, some noise and fading.
D—Poor circuit, weak signals, considerable fading and high noise level.
E—Circuit out.
* July 9-12 ** July 4-8, 16, 21-31
*** July 1-3, 13-15 **** July 17-20

For example, a circuit rated 2 in the Propagation Charts is expected to open with moderately strong signals (quality rating B) on July 9-12; with fair-to-poor signals on July 4-8, 16, 21-31; with poor signals on July 1-3, 13-15; and the circuit is not expected to open at all on July 17-20.

Since this type of forecast is very experimental in nature, the Editor of this column would appreciate reader's comments concerning the presentation of the Table, and its accuracy (or lack of it).

Solar Cycle

The Zurich Solar Observatory reports a monthly average sunspot number of 120 for April, 1960. This results in a 12 month smoothed running sunspot number of 140 centered on October, 1959. A smoothed sunspot number of 115 is predicted for July, 1960.

More Accurate Propagation Forecasts

The National Bureau of Standards has recently announced that it has increased the scope and reliability of its radio propagation prediction service. Practical experience with propagation forecasts over a period of nearly twenty years, together with a large volume of additional ionospheric and solar data obtained during the recent International Geophysical Year (IGY), have resulted in improved forecasting techniques, and more reliable basic propagation predictions.

Much of the world's radio transmission depends on the reflection of radio waves by electrons, or ions, existing in the ionosphere—that part of the atmosphere between 40 and 350 miles above the earth's surface. The physical characteristics of the ionosphere, and its ability to reflect radio waves, vary with geographic location throughout the world. They also change throughout the day, seasonally and with the sunspot cycle. Although the variations of the iono-

[*Continued on page 110*]

JULY-AUGUST, 1960

TIME ZONE: EST

Eastern USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western Europe	NIL	8A-1P (1) 1P-3P (2) 3P-7P (3) 7P-9P (2)	8A-2P (1) 2P-5P (2) 5P-10P (4) 10P-12M (3) 12M-4A (1) 4A-8A (2)	8P-10P (1) 10P-1A (3) 1A-2A (2) 9P-12M (1)*
Eastern Europe	NIL	12N-2P (1) 2P-4P (2) 4P-6P (1)	7P-10P (1) 10P-12M (2) 12M-2A (1)	NIL
North Africa	4P-7P (1)	7A-11A (1) 11A-2P (2) 2P-5P (3) 5P-7P (4) 7P-9P (2) 9P-10P (1)	1P-3P (1) 3P-6P (2) 6P-8P (3) 8P-10P (4) 10P-11P (3) 11P-4A (1) 4A-7A (2)	8P-9P (1) 9P-12M (2) 12M-2A (1) 9P-12M (1)*
Eastern Mediterranean	NIL	12N-3P (1) 3P-5P (2) 5P-7P (1)	2P-6P (1) 6P-11P (2) 11P-1A (1)	8P-10P (1)
Central Asia	NIL	1P-4P (1) 4P-6P (2) 6P-8P (1)	6A-8A (2) 8A-9A (1) 9P-11P (1)	NIL
Southeast Asia	NIL	4P-6P (1) 6P-8P (2) 8P-9P (1)	6A-8A (2) 8A-9A (1) 10P-1A (1)	NIL
South Africa	11A-1P (2) 1P-2P (1)	9A-12N (1) 12N-3P (2) 3P-4P (1)	12M-1A (1) 1A-2A (2) 2A-4A (1) 3P-4P (1) 4P-5P (1) 5P-6P (1)	8P-12M (1) 9P-11P (1)*
South American	8A-10A (2) 10A-5P (3) 5P-10P (2) 10P-1A (1)	6A-10A (2) 10A-1P (1) 1P-3P (2) 3P-5P (3) 5P-10P (4) 10P-2A (2) 2A-6A (1)	3P-5P (1) 5P-7P (2) 7P-2A (4) 2A-5A (2) 5A-7A (3) 7A-9A (2)	8P-9P (2) 9P-3A (3) 3A-5A (1) 9P-3A (2)*
Pacific Islands	2P-5P (1) 5P-8P (2) 8P-9P (1)	8A-12N (2) 12N-6P (1) 6P-8P (2) 8P-10P (3) 10P-12M (2) 12M-2A (1)	7P-9P (1) 9P-11P (2) 11P-4A (3) 4A-7A (2) 7A-9A (3) 9A-11A (1)	1A-5A (3) 5A-8A (1) 2A-5A (1)*
Australia	8P-11P (1)	8A-11A (1) 7P-9P (1) 9P-12M (2) 12M-2A (1)	10P-12M (1) 12M-2A (2) 2A-4A (3) 4A-7A (2) 7A-9A (3) 9A-11A (2)	2A-3A (1) 3A-6A (2) 6A-8A (1) 2A-5A (1)*
New Zealand	4P-7P (2) 7P-9P (1)	6P-8P (1) 8P-11P (2) 11P-2A (1)	7P-9P (1) 9P-11P (2) 11P-3A (4) 3A-8A (3) 8A-10A (2)	11A-12M (1) 12M-5A (2) 5A-8A (1) 2A-5A (1)*
Far East	NIL	4P-7P (1) 7P-9P (2) 9P-10P (1)	12M-6A (1) 6A-9A (2) 9A-10A (1)	NIL
McMurdo Sound	2P-4P (1)	1P-3P (1) 3P-4P (2) 4P-5P (1)	5P-8P (1)	2A-5A (1)

TIME ZONES: CST, MST

Central USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western Europe	NIL	12N-3P (1) 3P-5P (2) 5P-7P (1)	4P-6P (1) 6P-8P (2) 8P-12M (3) 12M-6A (1)	9P-12M (1) 10P-11P (1)*
Eastern Europe	NIL	12N-2P (1) 2P-4P(2) 4P-6P (1)	5P-8P (1) 8P-12M (2) 12M-3A (1)	NIL
North Africa	NIL	9A-11A (1) 11A-3P (2) 3P-6P (3) 6P-7P (2) 7P-8P (1)	1P-3P (1) 3P-5P (2) 5P-7P (3) 7P-9P (4) 9P-11P (3) 11P-5A (1)	8P-12M (2) 9P-11P (1)*
Eastern Mediterranean	NIL	12N-2P (1) 2P-4P (2) 4P-6P (1)	6P-9P (2) 9P-11P (1)	NIL
Central Asia	NIL	2P-5P (1) 5P-8P (2) 8P-10P (1) 8A-10A (1)	6A-9A (2) 8P-12M (1)	NIL
Southeast Asia	NIL	8A-10A (2) 10A-12N (1) 9P-1A (1)	2A-5A (1) 5A-7A (2) 7A-9A (1)	NIL
Central Africa	3P-6P (1)	8A-11A (1) 11A-3P (2) 3P-5P (3) 5P-7P (2) 7P-9P (1)	2P-4P (1) 4P-6P (2) 6P-8P (3) 8P-10P (4) 10P-12M (3) 12M-2A (1)	9P-11P (1) 9P-10P (1)*

TIME ZONES: CST, MST, CON'T

Central USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
South America	8A-10A (1) 10A-12N (2) 12N-5P (3) 5P-7P (2) 7P-9P (1)	6A-9A (3) 9A-2P (2) 2P-4P (3) 4P-8P (4) 8P-10P (3) 10P-12M (2) 12M-2A (1)	1P-3P (1) 3P-5P (2) 5P-7P (3) 7P-12M (4) 12M-4A (2) 4A-6A (3) 6A-9A (2)	8P-10P (1) 10P-2A (3) 2A-6A (1) 9P-2A (2)*
Pacific Islands	12N-4P (1) 4P-8P (2) 8P-10P (1)	11A-6P (2) 6P-8P (3) 8P-10P (4) 10P-12M (3) 12M-3A (1) 7A-9A (2)	6P-8P (1) 8P-10P (2) 10P-4A (4) 4A-6A (2) 6A-8A (3) 8A-11A (2)	1A-5A (3) 5A-8A (1) 2A-5A (2)*
Australia	3P-5P (1) 5P-8P (2) 8P-10P (1)	3P-5P (2) 5P-9P (1) 9P-11P (2) 11P-1A (1)	9P-11P (1) 11P-1A (2) 1A-4A (3) 4A-7A (2) 7A-9A (4) 9A-11A (2)	1A-3A (1) 3A-8A (3) 3A-5A (1)* 5A-7A (2)*
New Zealand	2P-7P (2) 7P-10P (1)	12N-2P (2) 2P-5P (1) 5P-7P (2) 7P-9P (3) 9P-10P (4) 10P-11P (3) 11P-1A (2)	6P-8P (1) 8P-10P (2) 10P-12M (3) 12M-2A (4) 2A-6A (3) 6A-9A (2)	11P-1A (1) 1A-5A (3) 5A-8A (1) 12M-5A (2)*
Far East	NIL	7A-9A (2) 9A-2P (1) 7P-9P (1) 9P-12M(2)	1A-7A (1) 7A-9A (2) 9A-10A (1)	NIL
McMurdo Sound	1P-4P (1)	12N-3P (1) 3P-5P (2) 5P-7P (1)	6P-8P (1)	2A-5A (1)

TIME ZONE: PST

Western USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western Europe	NIL	12N-1P (1) 1P-4P (2) 4P-6P (1)	6P-9P (2) 9P-11P (3) 11P-7A (1)	9P-11P (1)
Eastern Europe	NIL	11A-1P (1) 7P-8P (1) 8P-9P (2) 9P-10P (1)	3P-7P (1) 7P-12M (2) 12M-6A (1)	NIL
North Africa	NIL	12N-2P (2) 2P-5P (3) 5P-6P (2) 6P-7P (1)	1P-3P (1) 3P-5P (2) 5P-8P (3) 8P-10P (2) 10P-6A (1)	7P-10P (1)
Eastern Mediterranean	NIL	12N-7P (1) 7P-9P (2)	1P-3P (1) 3P-6P (2) 6P-10P (1)	NIL
Central Asia	NIL	8A-11A (2) 11A-6P (1) 6P-9P (2) 9P-11P (1)	11P-5A (1) 5A-9A (2) 9A-3P (1)	NIL
Southeast Asia	NIL	10A-1P (2) 1P-9P (1) 9P-11P (2) 11P-1A (1)	11P-2A (1) 2A-4A (3) 4A-6A (2) 6A-8A (3) 8A-10A (2) 10A-2P (1)	3A-6A (1)
South Africa	NIL	5A-7A (2) 7A-11A (1) 11A-1P (2)	2P-4P (1) 4P-6P (2) 6P-10P (1) 10P-12M (2)	7P-9P (1) 7P-9P (1)*
South America	9A-11A (1) 11A-1P (2) 1P-4P (3) 4P-7P (2) 7P-9P (1)	5A-8A (3) 8A-1P (2) 1P-4P (3) 4P-9P (4) 9P-11P (3) 11P-1A (1)	8A-3P (1) 3P-5P (2) 5P-7P (3) 7P-11P (4) 11P-1A (3) 1A-3A (2) 3A-5A (3) 5A-8A (2)	8P-2A (3) 9P-1A (2)*
Pacific Islands	12N-3P (1) 3P-6P (2) 6P-8P (1)	9A-12N (3) 12N-5P (2) 5P-7P (3) 7P-9P (4) 9P-12M (3) 12M-2A (2) 2A-5A (1)	4P-6P (1) 6P-8P (2) 8P-4A (4) 4A-9A (3) 9A-11A (2)	11P-6A (3) 12M-5A (2)*
Australia	2P-6P (2) 6P-10P (1)	1P-3P (2) 3P-7P (1) 7P-9P (2) 9P-11P (4) 11P-1A (3) 1A-3A (2) 3A-8A (1)	7P-9P (1) 9P-11P (2) 11P-4A (4) 4A-8A (3) 8A-10A (2)	12M-5A (3) 5A-7A (2) 2A-6A (2)*
New Zealand	1P-3P (2) 3P-6P (4) 6P-8P (3) 8P-10P (1)	10A-12N (2) 12N-4P (1) 4P-6P (2) 6P-10P (4) 10P-12M (2)	5P-7P (1) 7P-9P (2) 9P-12M (4) 12M-3A (3) 3A-7A (2)	11P-6A (3) 12M-5A (2)*
Far East	NIL	9A-11A (3) 11A-8P (2) 8P-10P (3) 10P-12M (2) 12M-1A (1)	8P-10P (1) 10P-12M (2) 12M-3A (4) 3A-6A (2) 6A-9A (3) 9A-11A (2) 11A-1P (1)	2A-6A (2) 3A-5A (1)*

RTTY

Byron H. Kretzman, KØWMR
108 W. Teresa Drive
West St. Paul, Minn.

Last month, for the benefit of the newcomer or the fellow just getting interested in radioteletype we began to explain this RTTY business as it is used in amateur radio. For the record, "Teletype" is the registered trade-mark of the *Teletype Corporation*, the manufacturer of just about all the machines that have been made available through legitimate RTTY societies to the radio amateur for experimental purposes.

Our explanation last month began with a description of an FSK station, such as might be used on 80, 40, 20, or 15 meters. FSK, by the way, is called type *F-1* emission by the FCC. While we are permitted to use any amount of shift up to 900 cycles, most of the time we use the standard shift of 850 cycles. This means that in the *space* condition (keyboard circuit open) the *rf* carrier should be 850 cycles away from the *mark* condition (keyboard circuit closed). Standard practice puts the *space* lower than *mark* for FSK. If a station inadvertently transmits *mark* lower we say he is "upside down." When FSK is received (and an audio type of TU is used), the *bfo* is adjusted so that the *mark* produces an audio tone of 2125 cycles and the *space* 2975 cycles. Note that the *mark* is now lower. This is standard operating procedure.

An AFSK Station

On *vhf*, on 6 meters and below, it is permitted to use Audio-Frequency-Shift-Keying (AFSK). In this type of RTTY operation an audio oscillator is frequency shifted and its output is fed into the modulator of the *vhf* transmitter. If it is an AM transmitter that is used, the FCC calls it type *A-2* emission, and if it is an FM transmitter it is type *F-2* emission. The FCC also stipulates that a shift of less than 900 cycles be used, and that the tones do not exceed 3000 cycles. The block diagram for an AFSK station is similar to that of the FSK station (using an audio-type of TU) except that the *bfo* in the receiver is turned off and the keyboard frequency-shifts an *audio* oscillator from 2125 cycles for *mark* to 2975 cycles for *space* instead of shifting a *vfo*.

AFSK operation on *vhf* is ideal for local net operation as crystal controlled surplus transmitters *and* receivers eliminate the *rf* stability problem and it is real easy to build a stable AFSK oscillator. In addition autostart operation can easily be used to permit starting and stopping of unattended machines on the net. In other words, you don't have to be around to receive a message. We will explain more about this very fascinating and unusual way of hamming at a later time.

Machine Theory

Let us discuss the "page printer" with keyboard. (We will ignore tape equipment for the time being.) This machine prints like a typewriter but on a roll of paper. The keyboard is similar to the typewriter keyboard except that the functions of printer and keyboard are mechanically separated. Electrically, the simple "loop" circuit between two machines is exactly like that of the old telegraph "neutral" circuit. See fig. 1. Like the telegraph circuit there is current in the line when no messages are being sent.

Instead of Morse code, a "five-unit permutation code" is used. Each letter or character is made up of a start pulse (always *space*), five selecting pulses, and a stop pulse (always *mark*). Fig. 2 is a graph of the line current in the circuit of fig. 1 for the letter Y. Note that the start pulse and the five selecting pulses are 22 milliseconds long while the stop pulse is 31 *ms*. Therefore each character is 163 *ms* long, limiting the maximum number to 368 "operations" per minute. When a character is sent, the pulses are stored and then accurately sent in correct time relation by a transmitting distributor, a mechanical device operated by a synchronous motor. When a character is received, the pulses

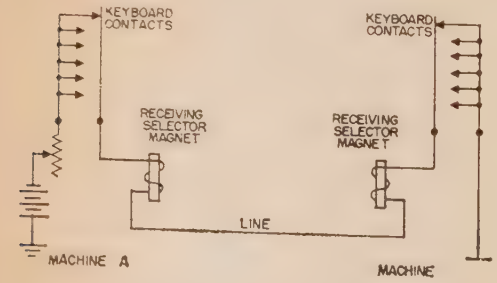


Fig. 1—Simple dc teletypewriter circuit.

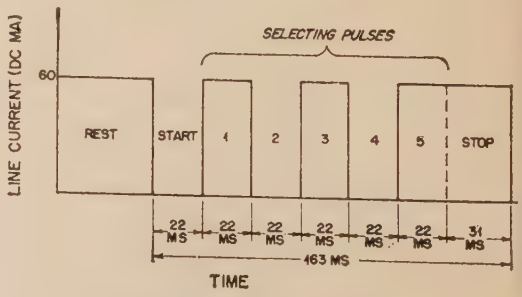


Fig. 2—Line current for letter Y.

are again stored and released to the printer mechanism through a receiving distributor when the seventh or stop pulse is received.

20 Meter RTTY

Last month we kind of poked a bit at a hornets' nest by merely mentioning that some RTTY *was* being operated above 14,100 *kc.* Letters received, particularly from the west coast, indicate a preference for just *below* 14,100, pointing out that DX RTTYers, such as PAØFB, ZK1BS, and TG9AD, have been hanging out from about 14,080 up to 14,100. A concentrated listening check made in May from here in the midwest bears this out. There *is* a trend towards the lower side of 14,100.

Tape

Those of you that have tape equipment will be interested to know that Bob Townsley, W6RCR, 5939 Almaden Lane, Oakland 11, California, has obtained a large quantity of surplus tape, standard 11/16" (pink/red) in 8" diameter rolls and is making it available to RTTYers at 15¢ a roll in box lots only. The tape is in boxes of 10, 40 (four 10-roll packs), and 30 (each in individual foil envelopes). Approximate weights are 13, 50, and 39 pounds, respectively. A special price of $10 for 80 rolls (100 pounds) is also available. All prices are FOB, Oakland, California.

Buck, W6VPC, of NCARTS, Inc., and I have checked and approved this tape. It's a good deal.

Dayton Hamvention

A real fine time was had by your RTTY Editor at the Dayton Hamvention May 6 and 7th. Almost 90 persons attended the RTTY Forum, which surprised Committee members who expected that the multiple scheduling of sessions would dilute this particular session. The RTTY Forum Moderator was Andy Henderson, W8WYL, who brought the newcomer up to date on RTTY.

Burt Jaffee, K9BRL, demonstrated the *Electrocom* FSC-250 terminal unit, and two Ohio, Bell engineers, E. N. Shook W8ZYW and C. G. Dew, discussed machines and demonstrated carrier multiplex using frequency shift keying.

A real bang-up time was had by all and the sessions were attended by many distinguished RTTYers, such as Ray Morrison W9GRW, George W9SPT, and Henry W4MGT. A big bouquet should go to the Dayton Hamvention Committee for a wonderful program. I especially enjoyed meeting Walt Burdine W8ZCV, the Dayton Amateur Radio Association President and former Novice Editor of *CQ*.

Across the Nation

W8ZEP is spreading the word on RTTY in the Cleveland area. A club or organization is in the works to further the exchange of information and to get a local net perking on 10 or 6 meters. Contact A. Panzer at 1245 East 83rd Street, Cleveland 3, Ohio, by postcard or by telephone for further information.

W7SMB/6, North Highlands, California

Operator:	E. M. Lenn
Exciter:	GSB-100
Transmitter:	4-400A, 304TH, pair of 450TH's
Receivers:	R-390A, NC-300
Converter:	CV-89A/URA-8A
Machine:	Model 15

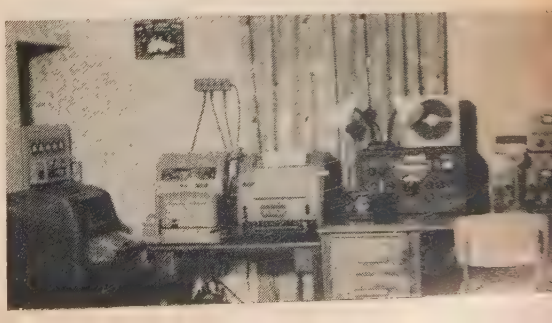
WØAGD has moved from Cedar Rapids to Waseca, Minnesota, and has a Model 15 ready for action. W9UE is looking for a synchronous motor and cover for his Model 15. Ben now has his 100-V, by the way. W4KZF is building a W2JAV TU. W4UPE is looking for a way to get rid of those unwanted fractions on his Model 15. (*Contact W9GRW or W2ZKV, Ed.*)

W5CIN is also building the W2JAV converter. (*April, 1958 CQ, if you are interested, and you should be.*) He is also looking for those 88 mhy toroids which are obtainable from W6CQK, 710 Madison Avenue, Redwood City, California. W9QZO in Sheboygan, Wisconsin, has a Model 15, a 75A-4, and the rig has a pair of 814's in the final.

73, Byron, W2JTP, KØWMR

W5YQE, Waco, Texas

Operator:	H. Jack Ellis
Exciter:	O-5C/Collins PTO
Transmitters:	PP 4-125A's
	Viking II
Receiver:	51-J
Converter:	CV-89
Machines:	Model 28
	Model 15
	Model 14 Typing Reperf.
	Model 14 Trans/Dist.



by DONALD L. STONER, W6TNS
P.O. Box 137, Ontario, Calif.

semiconductors

In the January 1960 Semiconductor Column, the writer described a piece of transistorized Russian test equipment. The response to the article was a little overwhelming. To a man, readers requested more information on projects of interest to experimenters and amateurs, which appear in Soviet magazines.

Such a circuit appeared in the January 1960 issue of *Radio*. It is a "Simple Millivoltmeter with Semiconductor Triodes", and is described by Y. Andrev. The meter uses four inexpensive transistors and two diodes, and will measure alternating current between 1 millivolt and 300 volts *rms*. It is useful for measuring any *ac* signal in this range and has a frequency response between 50 and 20,000 cycles (depending on transistor type used).

Circuit—The meter schematic is shown in fig. 1. As explained in the issue of *CQ* mentioned above, the comma is a decimal and the symbol "B" stands for volts in these schematics. Thus capacitor C1 is a 10.0 mf, at 15 volt, capacitor.

The various ranges are handled by an input voltage divider system. On the 10 *mv* range, the signal is coupled directly from the input terminals to the 1st amplifier (the range switch is shown in this position). On the 30 *mv* scale the input arm of the switch drops down to R1 and the first amplifier stage is connected to the junction of R1 and R2. These resistors act as a voltage divider to attenuate the signal. Each range has its own individual voltage divider. On the 300 volt range (at the bottom of the switch) the divider consists of a 560K resistor (R17) and an 18 ohm resistor (R18). The divider resistors for the lower voltage ranges are not exactly in 10 to 1, or 3 to 1, ratios due to loading by the 1st stage.

The electronics part of the tester is actually a four-stage R/C coupled audio amplifier. The first transistor, PP1, is connected in the emitter follower configuration to provide a high input impedance.

The signal is coupled to the emitter resistor of the 1st stage (R23) to the 2nd amplifier. The emitter of this stage is connected to the emitter of the output transistor (PP4) and a calibration potentiometer (R30). This control is actually 50 ohms, but 27 ohms is where the meter calibrates properly.

After four stages, the greatly amplified signal is applied to a voltage doubler rectifier system and the indicating microammeter (0-50 μ amps). Any *ac* signal appearing at the input terminals will be rectified and used to actuate the meter movement. A 9 volt battery provides the necessary collector current for the amplifier stages.

Construction—The construction of the meter is shown in the accompanying drawings. It is contained in a box measuring 220 x 105 x 95 *mm*. The components are mounted on a terminal board which sets behind the meter and switch assembly.

Transistors—Just about any audio transistor may be used in the meter. The RCA 2N109 and 2N217, the TI 2N1380, the GE 2N107, or the Raytheon CK722 should be satisfactory. The input stage, however, should be a low noise type

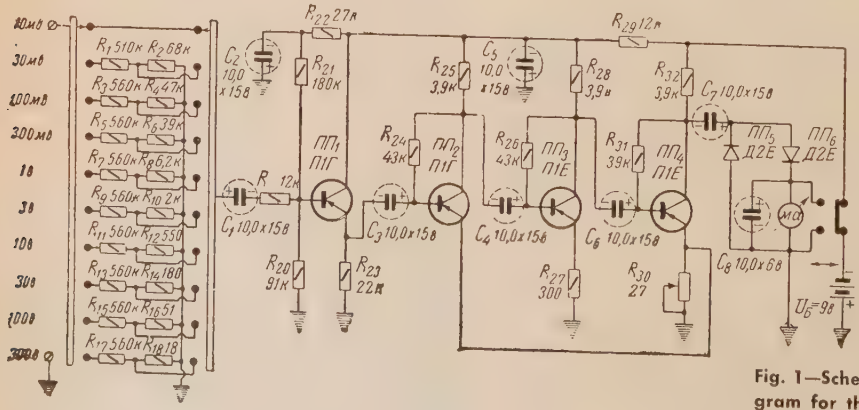
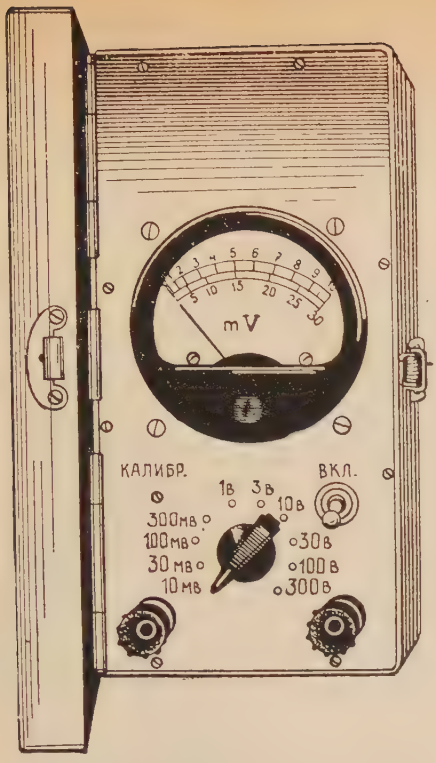
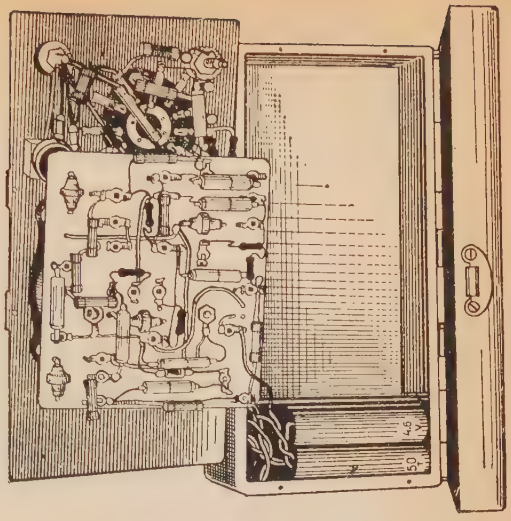


Fig. 1—Schematic diagram for the Russian AC Millivoltmeter.





Front and rear views of the Russian transistorized AC Millivoltmeter.

or there will be a high residual meter reading (rectified noise). An RCA 2N175 or 2N220 should be quite satisfactory.

It will undoubtedly be necessary to adjust the bias components for American transistors. Resistors R21, R24, R26, and R31 should be set so that each stage draws between 0.5 and 1.0 *ma.*

Calibration—Once the meter is completed, it is necessary to set and check the calibration. Potentiometer R30 is set on the 10 *mv* range, with a 10 *mv* signal applied, for a full scale reading. You can construct a 10 *mv* voltage source by connecting a voltage divider across a known *ac* source.

The individual calibration of each range, if you wish to do it, can be accomplished by adjusting the values of R2 through R18.

Tiros Satellite

The United States' new Tiros weather-eye satellite, the most elaborate electronics package yet sent into orbit around the earth, has as its primary power source more than 9,000 individual silicon solar cells.

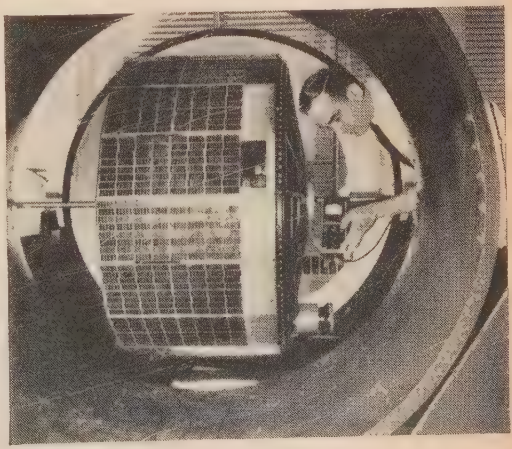
The Tiros system was designed and constructed by RCA's Astro-Electronic Products Division at Princeton, N. J., for the National Aeronautics and Space Administration, under the technical cognizance of the U. S. Army Signal Research and Development Laboratory.

The Tiros is equipped with the largest array of silicon solar cells (9,200) ever launched into orbit, and marks the first application in history of solar cells powering miniaturized television equipment.

The high efficiency cells, measuring 1 x 2 centimeters each, are mounted on the top and sides of the space vehicle to generate power directly from sunlight. They operate the complex electronic equipment in the satellite. Each cell is equipped with a special optical coverglass to protect it from micrometeorite abrasion, and to reduce cell temperature.

The cells are mounted in "shingles" of five each on printed circuit boards holding 80 cells in series. These 80 cell modules are mounted in parallel in groups of four on a panel, and interconnected to give the output voltage required for the portion of the power supply concerned. The power supply as a whole has outputs of 28 volts and 14 volts to accommodate the various power requirements of the satellite system.

Although the solar cell array is capable of an instantaneous power output of 58 watts,



The Tiros satellite, containing 9,200 solar cells, prior to launching.

nickel-cadmium batteries are used to store the solar energy in order to provide peak power to the instrumentation package, as well as to maintain a constant power supply, even during periods when the vehicle is in the earth's shadow.

A secondary application of the solar cells on the satellite involves their use as "north indicators" when the TV cameras are taking pictures of cloud patterns. This essential north reference is obtained by an arrangement of specially recessed solar cells at nine points around the sides of the satellite.

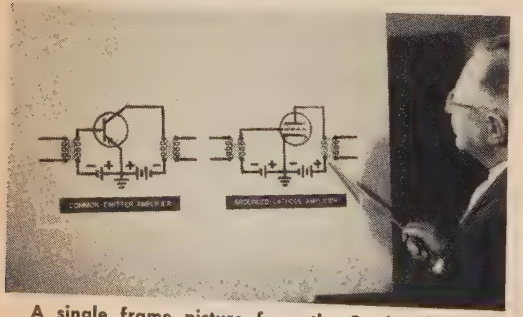
Each cell, covered with a plate containing a narrow slit, "sees" the sun for a brief instant through the slit as the satellite revolves, and produces an electrical impulse. Transmitted to the ground with each picture, these pulses tell the direction of the sun in relation to the satellite at the instant of picture taking.

At the ground station, a sun-angle computer processes the information for display next to the picture. Combined with attitude data and the known position of the satellite, in orbit at the time of picture-taking the information permits identification of north in each picture.

QRP Corner

George Calhoun, KH6VF, 136 S. Cane St., Wahiawa, Oahu, Hawaii, is having a "ball" with his mighty 100 milliwatt QRP 40 meter rig. On April 5, George was in contact with W8QOH/5 in New Orleans and W6RW in Los Angeles. Both stations stood by for the QRP job and W6RW reported RST 349, although the W8 couldn't hear him. The contact is even more amazing when you consider that George was operating in "kilowatt alley", on 7007 *kc.* On April 6, KH6VF worked W6ASH in San Francisco without firing up the big rig. His report was 439 and W6ASH made a tape recording of the transmissions.

George's li'l rig uses an RCA 2N373 xtal oscillator driving a 2N373 *rf* amplifier. He chose these transistors because of their low cost and high performance. Power is supplied by a 12.5 volt mercury battery and he loads the final to 8 *ma.* He can contact Hilo (about 200 miles away) by QRP'ing the QRP rig and running 6 volts at 3 *ma* and receives 569 reports. If you hear KH6VF on, give a lisen for his low power rig.



A single frame picture from the Semiconductor film produced by Bray Studios, and described in the text.

Educational Films

Club program directors, who always have trouble locating entertaining speakers, will be interested in a new series of educational films an semiconductors.

The Bray Studios, Inc., 729 Seventh Avenue, New York 19, N. Y., have two films titled Semiconductors, parts 1 and 2. The first film lasts 21 minutes and describes basic physics, hole and electron flow and junction principles, transistor operating characteristics and how they amplify. Part 2 discusses amplification, circuits, and a detailed analysis of the various transistor configurations.

The films may be purchased for $100 or rented for $10.00 each. If your club is interested, have them drop a line to the above address.

New Book

A new book, "Tubes and Transistors: A Comparative Study", is available from the Electron Tube Information Council, 554 Fifth Avenue, New York 36, N. Y. The book discusses the advantages and limitations of both components and is intended to assist equipment manufacturers and design engineers in their selection of the most practical device for specific applications.

Semiconductor News

General Electric has announced a new line of germanium tunnel diodes designed for use as circuit reference elements. The rapid downward trend for tunnel diodes is reflected in the price of these units, the 1N2941 and 1N2969, at $5.50 and $6.00 respectively. These units have a peak current rating of 2.2 and 4.7 *ma,* and a ratio of 8 to 1. Speaking of tunnel diode

[*Continued on page 112*]

The Model 530 tunnel diode curve tracer being manufactured by Texas Instruments, Inc.

YL

by Louisa B. Sando, W5RZJ
212 Sombrio Drive, Santa Fe, N.M.

YL ops attending the 23rd Annual Oregon Amateur Radio Assn. Convention at Portland April 30-May 1, 1960. Left to right, front row: W7DIF, W7NJS, KN7IFI, K7IWU, W7GNC, W7NOK, K7BED, W7GRC, W7CPV. Second row: W7HHH, K7CBF, W7DIC, K7HKX, K7DQH, W7GFT, K7AJB, K7ADI, W7SYF, K7HRX. Third row: K7BII, K7CDL, K7AZC, W7SBS, W7ZMN, * . . , W7HPT, K7LQU, W7RVM, W7ZKY. Attending but not in the photo, W7VLG, W7IRF, K7CJH, W7HGS, W7ECC, W7JPI, W7RAX, W7SPC. During the convention the Portland Roses were hostesses to 170 YLs and XYLs, and had gifts of ceramic boxes they had made and potted ivy plants for all. The Portland Roses are already making plans for the National Convention to be held in Portland on Labor Day weekend in 1962.

*Louisa negelected to list this smiling YL's call. Louisa, who is on her way to the YL convention, will tag her in the next column.

The ALAMO YLs of San Antonio, Texas. L. to r., W5KQG, Fran; Katherine; K5OPS, Ethel (secretary); K5OPV, Aileen; K5PDI, Mary; W5TSE, Ella; K5YCE, Gerry; K5OPT, Ruth (president); and W5WXT, Inez (vice president).

YL Phone	Contacts	Sections	Score
W5DRI, Dena Morgan	633	70	55,387*
W5ERH, Betty Sutton	613	63	48,273*
K5BNQ, Doris Anderson	624	61	27,580

OM Phone	Contacts	Sections	Score
K2EIU, Kenneth Keeler	92	42	5040*
W8AJW, Jack Siringer	99	35	4450
KØSLD, Layne Labaume	90	37	4162*

YL CW			
KØIKL, Joyce Polley	400	58	29,000*
KL7ALZ, Geraldine Nichols	349	65	28,356*
K5LIU, Mildred Wright	339	55	23,306*

OM CW			
K6SXA, James Herndon	75	39	3656*
K2EIU, Kenneth Keeler	74	32	2960*
W9DYG, Fred Borcherdt	71	33	2928*

*Low power multiplier

Results 11th YL-OM Contest

Sincere congratulations to these top scorers in YLRL's 11th Annual YL-OM Contest held Feb. 27-28 (phone) and March 12-13 (CW).

In the phone section, this is the third straight win for Dena, W5DRI, and she placed second before that. Betty, W5ERH, moved up to second place, after making third high score last year. Doris, K5BNQ, who placed third, has held either second or third place for the three previous years.

In the CW section, top YL scorer was KØIKL, Joyce, who last year held high score for her call area. Geri, KL7ALZ, in second place on CW, was in this same position last year. K5LIU, Mildred, in third place, moves into the top three for the first time.

Among the OMs, K2EIU placed first on phone and second on c.w. W8AJW in second place on phone, made third last year and first in '58, '57 and '55. KØSLD in third place, is new in the top competition. On CW, K6SXA was winner in this section last year also. W9DYG is a new call for the three high scores.

The first place winners in each category will receive an engraved cup. Certificates will be awarded to high place phone and c.w. scorers in each district, U. S. possession and country.

Checking all of the contest logs was a huge job for YLRL V.P. W5EGD/3, Lillian Beebe, who called in the rest of the family to help, and burned the midnight oil many a night cross-checking calls, states, multipliers, etc. Lillian estimates there were over 1500 stations entered; about 400 YLs. About 10 logs were disqualified for being postmarked too late.

W5EGD/3 adds that she worked the c.w. section with a most unusual antenna—a drain-pipe extending from one end of the house to the other (all she had)—an inverted U, and with it she managed to work Poland and Russia.

YL-OM Contest Scores

YL Phone

W1RLQ	25,672
K1EIR	5462
K1ADY	3885
W1ZEN	3770
W2EWO	16,685
K2JYZ	12,953
K2ETC	10,166
W2YTI	9675
K2ZQG	4372
K2ZLN	472
W2OWL	3.5
W3TNP	39,243
W3ICQ	10,657
K3ESD	7344
W3UTR	6098
K3EHZ	5320
W3GTC	666
W3MDJ	Conf
W4WYR	28,421
K4CJW	17,368
K4UMN	1788
W5DRI	55,387
W5ERH	48,273
K5BNQ	47,580
K5MJW	37,905
K5YIB	33,335
K5JXD	14,287
W5ZPD	10,625
K5MIZ	4030
K6OQD	14,245
WA6HKE	7267
W6WBH	6560
W6JZA	6187
WA6CCR	3875
W6QMO	15
W6NAZ	Conf
W7CSQ	10,578
K7JQG	9067
K7ADI	6587
W7GGV	5270
K7BII	960
W8NDS	20,634
W8VRH	2875
W8WRH	1253
W8KLZ	465
W8LGY	262
K8MQB	110
K9AMD	17,050
K9QGR	8332
W9PEX	5293
K9IVG	2992
W9GME	1180
K9MZV	75
K9IWR	21
K9IXD	Conf
KØEPE	45,825
WØSZH	20,496
WØZWL	19,662
KØIKL	19,377
KØMMR	17,212
KØGRG	7875
KØGIC	7050
WØWDM	4455
KØITP	4200
KØBOF	1548
KØLGW	Conf
KH6DLD	47,013
VE3DDA	2126
VE4CB	5177
VE6RP	5163
JA1YL	3115
JA1AEQ/Ø	52
G3MER	615
KP4APX	11,917

OM Phone

K1HTK	3942
K1CCA	3487
K1EFI	3442

W1NEP	3368
K1LST	2680
W1NLM	2677
K1KBO	1350
W1LQ	855
K1CUD	850
W1MGP	760
W1BAB	637
K1DIR	450
W1NJL	100
K1DCB	75
W1VOE	25
W1GPN	Conf
K2EIU	5040
K2DJD	2025
W2PEV	1848
W2COB	1406
W2NNB	1017
W2DVC	561
W2ASV	367
W2MYN	270
W2CVW	64
K2UUT	31
W2LGK	26
K2RTQ	Conf
W3BVL	2102
W3QLW	1715
W3EIW	1540
K3GQW	1063
K3HFB	472
K3ALL	442
W3MSR	221
W3CDG	220
K3DPD	210
W3KQD	5
W3MGP	Conf
K4DLC	2728
W4DLH	2584
K4JIG	2537
W4JUJ	2103
K4STY	1860
K5SVC/4	1092
K4BQU	440
K4OVE	247
K4EPI	195
K4BVD	110
K4CVQ	45
W4KPB	31
K5WXK	3150
K5UYF	2640
K5EJQ	2480
K5USE	1620
K5KYD	1539
K5OCX	1320
W5ZUQ	1265
K5UTV	825
W5OUH	760
W5VZU	437
W5AWT	117
W5KNA	67
W5MHP	Conf
W5PGG	Conf
W6FGJ	2720
W6PVD	2560
K6CJF	2138
W6JVA	2135
K6GAI	1320
K6MPX	616
K6ICS	292
W6OII	150
W7SFK	3220
W7UWT	2932
W7QWE	2440
K7APJ	2100
K7KOI	1215
W7CBY	1200
W7EVU	850
W7WIA	510
W7DZB	431
K7KLU	Conf
W8AJW	4450*
W8QHW	2775
W8AYV	2066
K8KVV	150
W8NAN	110
W8HTA	Conf
W8DM	Conf
W9LNQ	2537
K9JIG/9	2100
W9QWM	1017
W9GWO	624
W9NLF	517
K9QEI	373
K9KQR	175
K9HRC	175
K9QFR	135
W9TDU	65
KØSLD	4162
KØPIE	4046
KØLUZ	1657
KØAJR	1624
WØIUB	1457
WØVBK	971
KØKYK	627
WØDIB	390
KØMQG	125
WØAQE	61
WØWUU	60
KØTYO	Conf
K2VTX/VE2	2668
VE3RN	517
VE6SB	630
VE7VJ	1437
VE7CE	1025
KH6BLX	946
KH6DJP	Conf
HH2LD	11
HP1AC	260
I1ZZ	45
I1TC	1
JA1BUN	87
JA1GC	30
JA1BLC	30
JAØFT	1
JAØIB	1
VP5RH	270
G3WP	5
PAØDVM	5

YL CW

W1RLQ	22,765
W3SLS/1	15,243
W1YPH	8544
K1ADY	5318
K2ZQG	16,000
W2EBW	9880
K2JYZ	6252
K2UKQ	5940
K2DKL	1448
K2PMR	1196
K2ZLN	601
K3EHZ	15,900
W3TSC	11,018
W3UTR	9420
W3KZC	5206
W3JWM	3093
W3CDQ	2968
K3GJE	276
K4JYQ	11,962
K4TFL	7353
W4UF	5754
K4VDO	2093
K5LIU	23,306
W4KZT/5	11,250
K5PFF	10,857
K5YIB	8558
K5MXO	5400
K5PLC	3060
W5EGD/3	Conf
K6OWQ	9350
W6PCA	4856
W6QMO	4166
W6WSV	1161
WA6AOE	500
K7HSB	8965
W7PUV	7901
W7PTX	7848
K8LPI	8457
K8MKG	5868
W8WRH	5775
W8KLZ	4600
K8MQB	168
W9MLE	17,242
W9USR	9712
W9PEX	6270
K9TUD	6045
K9HGY	4658
K9QGR	1680
W9OMZ	87
KØIKL	29,000
KØGIC	11,643
KL7ALZ	28,356
KH6BTX	8632
KN9TCM	637
WV2FYE	1006
JA1YL	616
JA1AEQ/Ø	148
G3MER	180
VK3KS	1260
OH5RZ	720
VE3DDA	620
VE5DZ	6846
VE2AOB	480

OM CW

W1NLM	1537
W1OOS	828
W1GPN	330
W1AZW	150
K1CDB	56
K1VOE	1
K1LPL	Conf
W1NJL	Conf
K1DRX	Conf
K2EIU	2960
K2DJD	1890
K2GTC	1470
WA2DGG	1063
K2PFC	1050
K2YXC	750
W2AAU	680
W2CVW	660
WA2EJZ	460
W2EMW	393
K2UUT	206
W2IP	176
W2NIY	87
K2OFD	4
K2VPB	Conf
W3FOX	2015
W3YVJ	1500
W3QLW	907
W3MSR	888
W3TSG	838
W3KQD	658
K3DKE	658
W3EIW	652
W3EIS	562

[*Continued on page 114*]

by DONALD L. STONER, W6TNS
P.O. Box 137, Ontario, Calif.

Novice

One of the most common requests received by your conductor is for a list of radio terms in general and ham expressions in particular. The science of electronics creates many words which are unfamiliar to the layman. To compound the situation, radio amateurs have a "language" all their own. When the two are mixed, as they are in this column, the result is so much jargon to the unlearned.

An excellent example occurred the other day. A friend, looking for one of my articles in *CQ Magazine*, was quite mystified by the whole thing. He has no connection with the electronics industry and it required a long time to explain what an eyeball-QSO was!

Several times I have compiled lists of amateur and radio terms for use in this column but I always end up by abandoning the project. When trying to define a radio term it is necessary to use other terms which have not been defined. In effect it is like chasing your tail!

I did, however, go over the Novice column for the past year and compile a list of words which might confuse the beginner. Although the explanations might add to the confusion, let's try them on for size. If they prove useful, we will do it again (with other words, of course).

Aerial—A system of conducting wires used for the reception or transmission of radio signals. The aerial serves to couple the transmitter energy to space.

Antenna—see aerial.

ARC-5—A popular series of government surplus transmitters and receivers. The three tube transmitters, which run approximately 75 watts input, are available for frequencies between 1.5 and 9.0 mc. The six tube receivers, which are very sensitive, are available for the same range.

Beam—An aerial system of conducting wires or rods, designed for maximum performance on a specific frequency (or group of frequencies), and used for directing radio frequency energy in a particular direction. A beam can usually be positioned, hence the term "rotary beam".

Buffer—A stage in a radio transmitter used to isolate the frequency determining circuits from the power amplifier. The buffer is also capable of amplification.

Code—A system composed of dots and dashes used to transmit messages either by radio or wire. The Morse code is universally used by radio amateurs.

CQ—A symbol sent by amateurs, and other radio operators, indicating their station is open for reception of messages or informal contacts. Also the title of a very popular amateur radio magazine.

Crystal—A device made from quartz which can be used to accurately control the frequency of a radio transmitter.

Crystal control—A radio transmitter controlled, frequency-wise, by a crystal. As contrasted to this method is the *vfo* or variable frequency oscillator.

CW—An abbreviation for continuous wave. It means a radio transmitter which generates a steady stream of radio frequency energy, which is shaped into dots and dashes for code transmission.

DX—A symbol meaning long distance. Thus, a dx contact is transmission between amateur stations in two widely separated places. On some amateurs bands a dx station may be only a few hundred miles away, however.

Eyeball QSO—A person-to-person contact, without the aid of intervening radio equipment. (See QSO.)

Field Strength Meter—A device for measuring the intensity of radio frequency energy radiated by a transmitting antenna. Thus by tuning the transmitter for maximum field strength, as indicated by the meter, the operator knows he is radiating a maximum signal into space.

Final Amplifier—The last amplifying stage in a transmitter, which supplies power to the antenna system. This circuit is sometimes called the power amplifier.

Frequency Doubler—A transmitter stage designed to double the input frequency. For example a doubler stage, supplied by a 4.0 *mc* source, would generate a signal at 8.0 *mc*. Similar circuits can be used as triplers and quadruplers, etc.

Fuse—A device for protecting electronic circuits. It consists of a fine wire designed to blow out, or open circuit, with a predetermined current flow. The value of current required to blow the element is its ampere rating.

Harmonics—Multiples of a fundamental frequency. Thus the second harmonic of a 4.0 *mc* frequency would be 8.0 *mc*. Harmonics may, or may not, be desirable in a radio transmitter.

Homebrew—Indicating that a piece of equipment was not purchased or made from a kit.

Designed to use, and made with, basic radio parts.

Impedance—Impedance is most easily understood when you consider it as a resistance to alternating current. Alternating current and direct current may affect the same component in an entirely different manner. A coil may have a resistance of 1 ohm and an impedance of 10 ohms. Thus the current flow, with *ac* and *dc* will not be the same.

Ionosphere—A layer of ionized gases which surround the earth and serve to reflect radio signals from one point to another.

Keying—Hhe art or system of forming dots and dashes (code) in a radio transmitter. A device to provide the proper spacing is called a keyer. A unit to audibly sound the code is a keying monitor.

Kit—A set of components, instructions, and miscellaneous pieces which provides everything necessary (except tools) to construct a piece of electronic equipment. No special knowledge is necessary to successfully construct a kit.

Load—A device, component, or group of components which absorb power. The power may be used or wasted. An antenna is a load for a transmitter, a speaker is the load for an amplifier, and so on. Load may also mean the art of tuning a transmitter to deliver the maximum radio frequency energy to an antenna.

Meters—A measure of radio frequency wavelength, usually from crest to crest of the wave. As an example, if you could see a 30 *mc rf* wave, and measure it, the distance from crest to crest would be about 32 feet, or a little less than 10 meters. Radio waves for the 40 meter band measure 40 meters from crest to crest.

A meter is also an indicating device which can be used in receivers and transmitters to measure current and voltage.

Mobile—The operation of an amateur radio station from an automobile.

Monitor—A device for observation of a function (see keying).

Neon Bulb—A lamp useful for checking radio frequency transmitters. When the lamp glows (ionized gas) it indicates the circuit being tested is generating or amplifying *rf* energy.

Net—A group of radio stations (amateurs and others) organized to pass messages from one point to another.

Note—The sound made by a radio transmitter at a remote receiving point. Usually refers to CW operation.

Novice—A beginning radio amateur who must be able to pass a written examination and receive and transmit 5 words in code per minute. The novice license expires at the end of one year and cannot be renewed.

Oscillator—A device for generating alternating current electronically. The oscillator may be low frequency (audio oscillator) or high frequency (radio frequency oscillator) and may be either variable or crystal controlled.

Pi-Network—A popular system for matching the final amplifier in a transmitter to the antenna.

RF—Abbreviation for radio frequency.

SWL—Abbreviation for short wave listener. A person who enjoys observing what takes place on the short wave bands.

SWR—Abbreviation for standing wave ratio. This is a measurement of the amount of *rf* energy sent up the transmission line to the antenna and the amount reflected back down the line from the antenna. The ratio is a measure of antenna performance. Thus a 1:1 SWR would mean that all the energy sent to the antenna is radiated. It is an exceptional antenna that does not reflect *rf* energy down the transmission line.

Transformer—A device for stepping voltage up or down, matching impedances, or filtering alternating current frequencies.

Transmission Line—A group of parallel conductors designed to carry *rf* energy from a transmitter to an antenna, or from the antenna to the receiver.

Transmitter—A device which generates and amplifies radio frequency energy. Information may be added to this energy in any number of ways, i.e. by breaking it into dots and dashes, or by changing the amplitude, frequency, or spacing with the human voice or music.

Tune-Up—To adjust a transmitter for correct operation.

VFO—Abbreviation for variable frequency oscillator.. A device for varying the frequency generated by a transmitter.

WWV—Government broadcasting stations which operate on standard frequencies and transmit standard frequencies (audio) and times. The accuracy of these signals is extremely good. Stations WWV and WWVH (Hawaii) may be found on 2.5, 5.0, 10.0, 15.0, 20.0, and 25.0 megacycles.

Watts—A measure of power. The watt is a product of the circuit voltage multiplied by the circuit current. For example, one ampere times one volt equals one watt.

Zero Beat—A condition when two signals are the same, frequency-wise.

A set of popular and useful abbreviations is the system of Q signals used by amateurs around the world. A complete list can be found in the *ARRL Amateur's Handbook*. Here are a few of the more popular and well-known Q signals:

QRM—Man made interference
QRN—Natural static
QRT—Stop sending
QRX—Standby
QSB—Fading
QSL—Confirmation
QSY—Change frequency

Actually the Q signals can be either a question or a statement simply by adding a question mark after the group. For example, the official definition of QRN is "I am being troubled by

static". When QRX? is sent, it means "Are you troubled by static?"

The Q signals are probably one of the handiest systems ever devised. By using only Q signals it is actually possible to carry on a conversation with an overseas amateur who does not speak a word of English!

As I said earlier, any attempt to document the jargon of amateur radio and electronics is doomed to failure in such a limited amount of space. With 80 pages, however, *Allied Radio* was able to do an excellent job of defining more than 5500 terms, abbreviations, and letters, in addition to a section of useful radio data and tables. This work, titled "Dictionary of Electronic Terms", published by Allied Radio, 100 N. Western Avenue, Chicago 80, Illinois, is a *must* for any amateur or experimenter. The dictionary is listed in the latest Allied catalog, on page 490, as their stock number 37K756, and is priced at 35 cents!

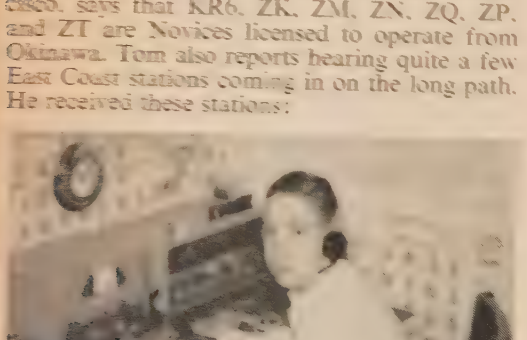
Who's DX?

A letter from Jimmy S. Aaboch, LA6CF, requests that I advise you chaps that he will be operating from the M/S Bonneville, which sails between the west coast of the United States and the Far East and looking for Novices on 40 and 15 meters. While staying at USA ports, Jimmy would like to meet Novices and have an eyeball QSO with them (see Stoner's "little jiffy" definitions for eyeball QSO-hi). You can contact [illegible] by writing in care of R. P. McGaughey, [illegible] Florida Way, Hollywood, Calif.

Flight Officer Gerry S[illegible], G-8203, reports hearing the following Novices in England:

March 2, 1730 GMT: KN8KXM, KN4PLW, KN9RTO. [illegible] 1741-1821 GMT: KN2MEA, MYN, KN8JDP, [illegible] March [illegible] GMT: WV2FJW, [illegible] KN2LWU, MNP, [illegible]

Contrary to what you might read, there are lots of Novices in the Far East. Tom, KR6ZT, CMARC, APO 331, c/o Post Master San Francisco, says that KR6, ZK, ZM, ZN, ZQ, ZP, and ZT are Novices licensed to operate from Okinawa. Tom also reports hearing quite a few East Coast stations coming in on the long path. He received these stations:



Mike Brown, K8QMK, graduated from the Novice ranks a short time back. That's mighty impressive wallpaper, Mike.

March 24, 1930 GMT: WV2FDA, KN4HQL, [illegible] March 26, 0400 GMT: WV6ZSN, and at 2200 WV2FBA WB6DOV. March 27, [illegible] GMT: WV6FSE, [illegible] 2FS, K1QA, KN7UY. March 28, [illegible] GMT: KN2MCW, WB6DKN, WV6FVC, GIQ, GVT, IVP, JRF, KN7JPB, KOF, KXD, LCR, WL7DJC, KN6VMB.

A quick jog south, and we arrive at the QTH of our old friend, Ivor Stafford, VK3XB. Ivor still needs six states to complete his Novice WAS. They are: Maine, New Hampshire, North Carolina, Idaho, Utah and North Dakota. Stations in these states (and others) can make skeds with Ivor by writing him at 16 Byron St., Box Hill S., E11, Victoria, Australia or by listening for him on exactly 7148 kc. usually between 0300 and 0430 Eastern Standard Time. The following stations were heard and worked on the 40 meter band by Ivor, between March 22 and April 19:

AA[illegible], LYF, MJC, NEA, WV6EJ, HGH, KN6IPB, [illegible] JJA, JOF, KFC, KTW KLZ, KSX, KN4IIN, ISF, JMP, JWM, KDD, KUF, LHD, MJD, PNM KLZ, PLD, QOG, RHK, SGR, SVT, PBR, KN8YCM, YKV, ZIM, BIT, GVR, WH6DIG, IOV, DKI, DMC, DNA, WP4AUW, WV6NVF HVV HXT [illegible] SN[illegible] IWC, [illegible] ASN, KHP, LRI, LSS, WL7DDW, DJN, DJU, KN5PYS, QSR, QSC, QLO, QWY, RSL, KN6SIR, SNF, VLR, VMG, KN6WMF, YYY.

Thanks for the list, Ivor, I hope you get those states!

From Ormond, Victoria, Australia, Bill Stevenson, VK3AWS, writes to report working the following stations on 15 meters: March, WH6DMU, WV6FKH, GDM, JFS, JJN, KN7IWD, KAH, KTN, KNOVVV, and in

Don Walter, KN8QZX, 110 Callahan Rd., Canfield, Ohio, should be a General by this time. He has been on for 6 months and worked 29 states with 26 confirmed. Don will sked anyone for any reason. He operates on 40 now, but expects to be on 80 and 15 meters soon.

April, KN4QZB, LHD, WG6AJI (new W call, is it Guam?), WV6FER, FZM, GBZ, HVI, HZI, IPY, IVP, KN7IPI, JRF, LLY. Bill says it is impossible to make skeds, but he is on listening for Novices at 7:30 to 9:30 Pacific Standard Time each Friday. Give a listen for him.

I came across a list of stations heard in JA land, but due to my efficient, systematic, organized method of filing I cannot determine who sent them! The report covers Feb. 29 to March 22, on 15 meters, and reads like this: KN4PNM KL7, WG6AJI, WV6FIU, ISO, IVP, KN7HOK, HOR, KML, KTS, KUK, LCN, LCR, WL7DIC, DIK, DGP, DJI,

KNØVVV. Thanks to my unknown contributor, anyway!

Floyd D. Fitzgerald, 413 West Cherry, Fairbury, Illinois, writes to say that HL9KI originates in Seoul, Korea. They are using a BC-610, and rhombic pointed towards the states. The station often calls CQ-Novice.

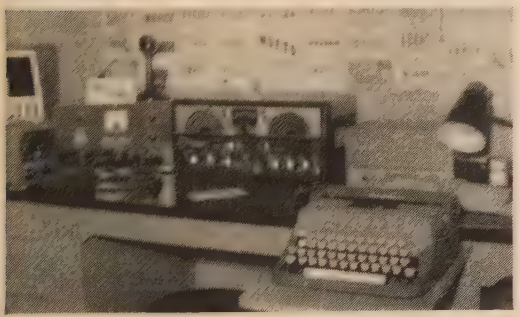
Help Wanted

Beginners in the San Diego, California, area will be interested to learn of the code and theory class taught at Hoover High School. If interested, contact E. C. Sherrill, K6JFP, 4745 49th St., San Diego 15, California.

The following persons have written in, requesting help with their tickets. Can you give them a hand?

W1—Gerald Raymond, 6 Middle St., Waterville, Maine. TRinity 2-9586

W2—Albert R. Friedrich, 422 E. 25th Ave., N. Wildwood, N. J.



From up North, Noel Elliot, VE3CWK, Meadowvale, Ontario, Canada, sends up a photo of his neat installation. Noel has worked 48 states and 10 countries in 6 months of operation. In addition to this equipment he has an antenna farm consisting of a 250' longwire for 80, dipoles for 40 and 20, and a full wave antenna for 10 meters.

John Gradner, 108 Bayville Ave., Bayville, L. I., N. Y. Phone TW 5-2907

W3—Ed Kiely, 550 Pershing Ave., Lancaster, Penna.

W4—Bill Gilliland, Rt. 1, Box 78, Brooksville, Mississippi

Ray D. Begsley, 300 Monte Vista, Charlottesville, Va.

W5—Ralph Harbus, Mineral Wells, Texas

W6—H. W. Empson Jr., 5542 Olanda St., Compton, Calif. Phone NEwmark 2 8135

W9—Le Roy W. Eaton, 904 Pleasantview Drive, Tuscola, Illinois

VE2—Milville Brassard, 111 Champlain Ave., Kenogami, Que., Canada

Letters

A new ham in the 50th state cracks the nut this month. Vernon Martin, 13, lives at 2360 Jasmine St., Honolulu 16, Hawaii, and holds call letters **WH6DIG**. Vern runs a Globe Chief 90A and SX-71 to 40 and 15 meter dipoles. The WAS, from that distance, stands at 14/6 with KZ5, LU2, and ZL1 accounting for the dx.

Dave Sjohn, **KN8ROR**, 408 Elm St., Paw Paw, Michigan, has worked 11 states in a little over a month with his AT-1 and S-108, which he hopes to replace with a Viking Ranger. Dave would like to make skeds and would also like pen pals.

Jack MacDonald, 70 Pomeroy Rd., Madison, New Jersey holds call letters WV2KVR and operates on 15 meters with the gear shown. Not shown, outside the shack, is a HyGain 14AV vertical.

Lloyd Westbrook, 125 Cherry St., Commerce, Ga., is **KN4HQI** and he wrote to say the dx was up to 35 countries, with the addition of OA3, OX3, UP2, OE3, VP7, and an OQ5. Sorry the pix was too dark, Larry.

Bruce Hedendal, **WV2JUB**, 228 Jefferson Avenue, Paramus, N. J., whacks away with a DX-35 and AR3 connected to a 45 ft. wire. Bruce has his WAS up to 26 22, with VE5 as best dx. He would like skeds with W7 land and wants to join the Rag Chewers Club.

Jim Hill, **KN7JVR**, 701 East Winter Dr., Phoenix, Arizona, puts his head on the block with an offer to sked anyone needing his state. He runs a DX-20 and SX-100 into a 3 element beam. The WAS is 46/46 and the dx roll looks impressive with VE's, ZL's, JA's, DL, and FF8. Jim needs Nev. and Del.

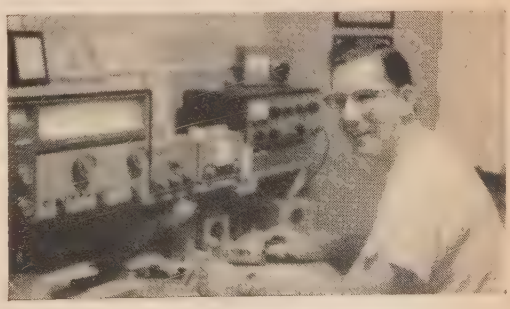
Joe McConaghy, **KN3JGJ**, 126 E. Lancaster St., Downingtown, Pa., is burning to work the following states: All W7 district, Maine, Colo., N. Dakota, S. Dakota, and Nebraska. Drop him a line for a sked.

Mike Brown, **K8QMK**, 103 Forrer Blvd., Dayton 19, Ohio, should have his ticket by this time, but still likes the Novice bands. Mike runs a S-108 and DX-40 to a folded dipole about 20 ft. off the ground. His WAS is riding at 36/35 and dx at 4/3. Mike will sked for any reason and would like skeds with Alaska and Hawaii.

Bert Garcia, **K7LKO**, Box 35, Utah General Depot, Ogden, Utah, has piled up 45 states, along with KS4, UA1, JA3, KG6, KP4 and a VP5 on his Super Skyrider and Challenger. Bert would like to join a *cw* net in the Utah area—are there any?

Joe Gabus, **WV2IHP**, Box 85 Livingston Manor, New York, made the General class ranks recently, and will be on the air from his new QTH using an Eico 720 and rewired SX-99. Joe's first rig was a little 15 meter job out of Popular Electronics magazine.

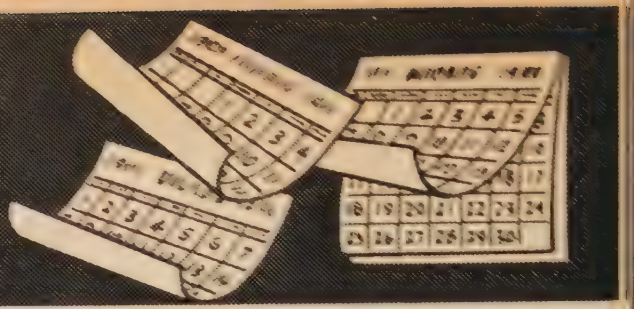
[*Continued on page 115*]



David Fisher, 3521 — 164th St., Hammond, Indiana, is KN9VQN and operates 40 exclusively, on 7197 kc. Dave would like skeds for any reason, and QSL's 100%.

CONTEST CALENDAR

by Frank Anzalone, W1WY
14 Sherwood Road Stamford, Conn.



August	27-28	JARL DX
September	10-11	Peruano CW
September	17-18	Peruano Phone
September	17-18	SAC CW
September	24-25	SAC Phone
September	24-25	MARC VE W
October	1- 2	VK ZL Phone
October	8- 9	VK ZL CW
October	15-16	WAS SSB
October	22-23	Boy Scouts
October	28-30	CQ WW DX Phone
November	12-13	ARRL SS
November	19-20	ARRL SS
November	25-27	CQ WW DX CW
December	3- 4	RSGB 21 28 Phone

All the above dates have been officially established and are announced at this time to serve as a guide for other organizations who might have ideas of running a contest. It will be noted that practically every week-end, September thru November, is all booked up. In some cases there has been a doubling up of dates, but by careful planning, two dissimilar activities (CW & Phone) are scheduled on the same week-end, thus cutting to a minimum the damage of such a conflict.

Much of this was accomplished by extensive correspondence with the many organizations involved. This I was happy to do since the end results are most gratifying. Everybody was most cooperative, that is, almost everybody.

Based on past activities, is only one major organization to be heard from, the LABRE, Brazil.

It is hoped that organizations planning future contests will first check dates of past activities in order to hold possible conflicts to a minimum. We will be glad to act as a clearing house for this information. But in order to be able to do a good job it is necessary that all organizations keep me posted on their *anticipated* activities. Let's give it a try.

JARL DX

Starts: 10:00 GMT Saturday, August 27th.
Ends: 16:00 GMT Sunday, August 28th.

The Japan Amateur Radio League was organized for juridical persons on December 1st 1959. To celebrate this the JARL has organized the first all Asian DX Contest.

The object of the contest is for amateurs located in other countries to contact as many Asian stations as possible, during the contest period of course. Use all bands 3.5 thru 28 *mc*; CW only. Competition is both for single band and all bands.

Serial Nrs.—For OM stations: A serial number of five figures will consist of the RST report plus two figures representing your age. (Oh Oh They had better change that.)

For YL stations: RST plus the figures 0 0 (Zero, zero) (Why not make it 21 plus?)

Scoring—

(1) One point per contact.

(2) A multiplier of one for each Asian country worked on each band. (For Asian stations, one for each non-Asian country as per listing in DXCC and WAE country lists.)

(3) Final score for a single band, contact points times the country multiplier.

(4) Final all band score, total contact points on all bands times the sum of country multipliers on all bands.

Awards—Certificates will be awarded in each country as follows:

(a) Highest scoring operator on each band.

(b) The 3 highest scoring operators on all bands.

(c) In addition, a cup will be awarded to the highest scoring operator on all bands in each continent.

Logs—Your log should show in this order: Date, Time (GMT), station worked, serial number sent and received, country worked (underline each new multiplier) and points.

Include a summary sheet with the scoring, your name and address (BLOCK LETTERS) and other pertinent information. A signed declaration is also requested.

All logs must be postmarked no later than September 30th and sent to: The J.A.R.L. Contest Committee, P.O. Box 377, Tokyo Central, Japan.

Peruano

CW Starts: 12:00 EST Sat., Sept. 10th.
Ends: 14:00 EST Sun., Sept. 11th.

Phone Starts: 12:00 EST Sat., Sept. 17th.
Ends: 14:00 EST Sun., Sept. 18th.

This year the Radio Club Peruano will celebrate its 30th anniversary and special awards are being planned.

Serial Nrs.—The customary five and six figures. Signal report plus a progressive three digit number starting with 001.

Scoring—

(1) One point per contact.

(2) Multiplier of one for each country worked.

(3) An additional multiplier of two for each different band used and confirmed by at least one contact.

(4) The final score will be the total number of contacts multiplied by the sum of the two multipliers as indicated above.

(5) Your log must contain at least one OA contact and your own country can be worked once per band for multiplier purposes.

Awards—A medal and certificate will be awarded to the highest scoring station in each country and each W/K and VE district, plus additional special awards.

Include a summary sheet with your log, summarize your score and make sure you include your name and address. Sign the usual declaration.

Mail your log within 20 days to: Radio Club Peruano, Att: Pres. Commission Concurso, Casilla 538, Lima, Peru.

VK/ZL

Phone Starts: 10:00 GMT Sat. Oct. 1st.
Ends: 10:00 GMT Sunday, Oct. 2nd.

CW Starts: 10:00 GMT Sat. Oct. 8th.
Ends: 10:00 GMT Sunday, Oct. 9th.

This year's contest is sponsored by the New Zealand Association of Radio Transmitters. You will note that the rules follow a different pattern than those of last year's contest which was sponsored by the W.I.A.

Serial Nrs.—The usual five and six figures. Signal report plus a progressive three digit number starting with 001.

Scoring—One point per contact. The final score will be derived by multiplying the total number of contacts on all bands by the total number of VK/ZL districts worked on all bands. These are ZL1, 2, 3, 4, 5 and VK1, 2, 3, 4, 5, 6, 7, 9, Ø.

Logs—(a) Must show in this order: Date, time (GMT), station worked, serial number sent and received and each new VK/ZL district worked.

(b) Use a separate log sheet for each band.

(c) Summary sheet to show: call, name and address (BLOCK LETTERS), and figure your total score.

(d) Sign a declaration that all rules have been observed.

Awards—Especially colorful certificates to the highest scorer in each country and each USA call area. Also additional awards for separate bands and from areas where the returns warrant.

Listeners Section—There are also awards for SWLs. Their logs must show the call of the VK/ZL station heard and the call of the station he is working. Also the serial number sent by the VK/ZL station and the time and band. Scoring is on the same basis as for the transmitting section.

Logs must be in the hands of the N.Z.A.R.T. no later than January 20, 1961. The address: Contest Committee, P.O. Box 489, Wellington, New Zealand.

Ed Note

As you can see there is a full calendar of contest activity ahead for the Fall season.

Next month we will bring you additional details on some of the other scheduled activities.

[*Continued on page 116*]

Results of VE/W 1959 Contest

Frank Anzalone, W1WY

Gordon Webster, VE2BB reported a very successful contest last September, with a total of 403 logs received.

J. R. Herndon, K6SXA was the contest winner and will have his name inscribed on the permanent M.A.R.C. Trophy.

The top calls in each section will also receive certificates.

The disqualifications were only due to late arrival of logs or exceeding the 20 hour operating limit.

Following is a complete list of scores. Space does not permit the inclusion of the number of contacts, sections worked and the power multiplier, all of which contributed to the final score.

CANADA

Martime (VE1)	
VE1EK	53,568
VE1ADH	48,645
VE1OZ	41,328
VE1IM	36,064
VE1UD	11,400
VE1UW	10,560
VE1CZ	6,708
VE1DB	4,836
Quebec (VE2)	
VE2ASW	63,896
(K2VTX/VE2 Opr.)	
VE2BK	45,240
VE2BAT	37,620
VE2AYY	34,870
VE2ATU	30,672
VE2AGN	23,760
VE2HN	22,608
VE2JY	22,344
VE2AWO	21,762
VE2WA	16,560
VE2DR	13,728
VE2SS	13,344
VE2RL	2,679
VE2ABE	650
VE2ABV	120
VE2AJD	75
Ontario (VE3)	
VE3BFF	83,616
VE3AD	83,144
VE3DDU	80,352
VE3CFU	79,560
VE3CGL	65,934
VE3DXP	49,952
VE3CLF	49,818
VE3BOG	49,324
VE3BTN	49,296
VE3EMA	49,152
VE3BLU	46,534
VE3DGW	37,260
VE3PV	35,775
VE3BWL	27,200
VE3MI	22,410
VE3CVV	22,072
VE3ATZ	22,050
VE3DYJ	20,757
VE3DLS	18,036
VE3BUR	17,784
VE3CWA	13,344
VE3LC	9,170
VE3AYX	7,067
VE3IA	5,160

K4CLI/VE3 5,046
VE3DJR 4,680
VE3CVU 4,140
VE3CTN 3,978
VE3DEL 1,900
VE3BUU 433

Manitoba (VE4)
VE4SL 78,192
VE4IM 63,840
VE4SX 31,824
VE4EF 18,492
VE4GB 5,600
VE4CF 2,376
VE4MH 1,632
VE4MD 1,467
VE4HS 30

Saskatchewan (VE5)
VE5KY 37,152
VE5AH 27,852
VE5DZ 21,266
VE5PR 17,100
VE5NQ 10,890

Alberta (VE6)
VE6AD 53,784
VE6TP 31,200
VE6SF 28,905
VE6TY 24,600
VE6WG 10,579

British Columbia (VE7)
VE7EH 100,713
VE7ASP 67,600
VE7AOI 52,896
VE7ABE 32,640
VE7AGC 30,498
VE7JN 18,720
VE7AC 16,758
VE7JQ 9,828
VE7AER 9,672
VE7AJ 1,428
VE7BAV 1,288
VE7ANQ 700
VE7OJ 196

NWT/Yukon (VE8)
VE8MX 44,414

Newfoundland Labrador (VO1-VO2)
VO2AW 22,756
VO2NA 12,804

UNITED STATES

Vermont
K1HMQ 2,600

Rhode Island
K1BBK 15,018

New Hampshire
W1ZQR 6,498
K1MIO 3,177
K1IIK 1,191

Maine
W1SWX 9,097
K1GOG 2,744
KN1KSG 650

Connecticut
W1WY 60,431
W1TS 33,790
K1GMI 11,263
W1IJO 10,108
W1NLM 8,676
W1DGL 1,762
W1MBX 1,300
K1CCB 1,083

East Mass.
W1MIX 37,905
W1NJL 27,630
W1FJJ 26,534
K1DIR 20,843
W1AQE 9,097
W1PLJ 7,148
K1CZM 1,841
K1AIO 1,444

No. N. Jersey
W2EQS 52,959
K2KFP 44,186
K2THC 30.216
W2OPR 25,775
K2UUT 17,220
W2PTS 14,444
WA2ASM 13,538
WA2CPT 12,346
K2LWO 5,957
W2ZVW 3,888
K2MFF 2,437
WA2CVP 2,166
K2PTI 1,588
WA2ATH 1,408
W2EWZ 271

So. N. Jersey
W2EXB 32.923
W2QDY 28,014
K2SLJ 5,198
W2BEI 1,956
W2UAP 324

NYC-L.I.
K2UVV 19,819
WA2AZE 14,621
WV2DQM 11,209
WA2BVH 5,632
W2DUN 4,332
K2ZYR 4,224
W2PVQ 3,087
WA2AWH 1,949
WV2EFN 217
W2JCA 159

East New York
K2HVN 42,886
W2TER 29,458
K2YIG 10,234
WA2EKE 3,249
WA2BPQ 2,277
K2KUA 1,462

West New York
K2MWK 97,957
WA2BEX 85,286
K2MWM 25,017
K2HVS 24,837
K2IMK 15,704
K2KKH 10,180
K2ZRE 9,819
W2MTA 8,935
K2SSB 4,657
W2KAT 3,466

Md. - Del. - D.C.
W3KLA 80,413
W3MSR 32,490
K3APM 30,703
W3IWJ 21,660
K3CXX 16,678
K3GIT 15,920
K3DEI 9,819
K3CHP 9,603
W3HRE 5,415
W3MCG 2,112
W3JSL 1,877

East Penn.
W3GOQ 56,045
W3AIZ 49,385
W3SOH 46,298
W3ADE 36,822
W3ARK 32,165
W3EFY 26,425
K3DHX 17,328
W3JXA 12,455
W3YLL 7,310
W3NF 3,577
K3ATX/3 814

West Penn.
W3NCF 45,486
W3NKM 45,324
W3DQN 15,704

Alabama
K4RJM 48,248
W4KAC 31,190

No. Carolina
K4IEX 73,102

So. Carolina
W4BWZ 43,320
K4MUP 1,805
K4DOF 36

Kentucky
K4YFB 33,356
W4OMV 8,953

Tennessee
K4PHY 49,385
K4LPW 49,096
K4RIN 27,292

Virginia
W4HTV 73,103
W4NPT 46,136
W4EUX 39,277
W4FZG 24,259
W4KFC 22,743
W4JAT 13,636
W4DVT 3,177

Georgia
W4BEY 56,533
W4EJI 55,089
W4ZKU 40,613
K4BAI 39,963
K4VHC 28,050
K4VTH 19,169
K4UJS 16,299
K4EEK 7,328
W4BHG 6,931

East Florida
W4GOG 58,482
K4RAD 56,045
K4KOD 46,786
K4ZRU 38,501
K4IEH 4,910

Mississippi
K5IIN 98,445
W5AMZ 21,660

New Mexico
K5UYF 60,919
K5RMV 29,891
W5NXF 6,209

Arkansas
K5JPB 51,984
K5QHS 19,061
K5TYW 5,559

South Texas
W5PSB 82,850
K5QFM 42,742
W5LGG 25,992
K5LGH 23,826
K5JFP 18,519
K5LZB 3,574

North Texas
K5IID 45,486
W5ZSX 34,115
K5MBB 29,241
W5TPZ 14,404

Oklahoma
K5OCX 20,216

Louisiana
K5ESW 114,365
W5KC 82,850
K2OWE/5 45,811
W5BUK 42,887
K5LXZ 37,526
K5SYJ 15,162

S.V. (Calif.)
K6SXA 144,256
K6SXX 11,372

East Bay (Calif.)
K6QHC 91,272
K6QKR 42,887
W6IPH 14,726
W6KG 10,397
WA6BPE 7,310

S.B. (Calif.)
W6DOP 31,461
K6KDP 24,259
K6MQK 1,625

S.J.V. (Calif.)
K6ROU 18,519
K6RAU 14,657
WV6FOL 217

(S.D. (Calif.)
K6VOQ 13,646
WA6CEZ 9,350

S.F. (Calif.)
K6NCG 57,760
K6EIE 45,053
W6YC 17,328

S.C.V. (Calif.)
W6JKJ 34,656
WA6HRS 10,072

L.A. (Calif.)
W6NZW 42,768
W6NKR 33,465
K6KUU 26,570
WA6CGS 16,678
W6CIS 16,464
W6UFJ 12,996
K6CDW 2,816

Washington
K7CHH 32,057
K7APJ 29,458
W7ECX 18,194
W7IEU 6,823
K7EHV 1,462
KN7HBN 545

Arizona
K7CEG 14,151

Idaho
K7BWV 14,783
K7DAS 10,722
K7GTK 2,437
K7CPC 1,625

Montana
K7ABV 15,541
K7CTI 12,130
W7EWR 3,791

Oregon
W7JLU 15,920
W7IAQ 7,960
K7EAU 2,599

Wyoming
W7ABO 2,708

Utah
K7CDV 14,440

West Virginia
K8ELF 36,064
W8OFE 26,642
K8JLF 5,632
K8BIT 3,899

Ohio
W8AJW 74,077
W8QHW 72,200
W8DWP 49,223
K8HVT 37,526
W8YPT 36,551
K8EGY 29,183
K8HBN 26,911
K8KFP 26,554
K8MTK 24,259
K8BXU 22,418
K8EZJ 19,169
K8IPS 14,783
W8YGR 12,021
K8KOP 4,332
K8MMO 2,430
W8BDO 1,588
K8KMY 379

Michigan
W8APN 59,457
K8KVV 53,717
K8KCO 33,356
K8QJH 33,140
W8MSK 26,858
K8LJB 24,043
W8PXA 12,735
W8SPC 5,686
K8IUZ 4,332
K8LWP 1,083

Wisconsin
W9UNJ 35,577
W9RKP 35,089
K9ELT 27,725
W9CHD 21,985
K9LWV 11,696
K9MKC 6,498

Indiana
W9IOP 64,818
K9KJD 48,139
K9JRG 38,988
K9MMH 34,602
K9LIO 33,356
W9WCS 13,285
K9ICG 11,552
K9KBW 6,823
K9KJE 6,498
K9PYO 1,083
K9RIT 217

Illinois
W9WNV 95,521
W9LNQ 56,533
W9PNE 52,634
K9KYR 51,172
W9YYG 33,140
K9JLR 31,624
K9BJM 25,992
W9BZW 19,494
W9MAK 15,270
W9QQG 12,180
W9YDQ 12,130
W9QXO 11,697
K9RUN 10,394
K9ORC 5,632
K9IMW 4,874
W9ZTK 4,874

Missouri
WØQWS 43,898
WØGAX 42,454
KØUDQ 31,900
WØBTD 29,891
WØARO 25,830
KØRAL 18,573
KØGSV 10,992

North Dakota
KØOSW 15,162
KØMPH 13,808
KØOSV 12,996

Cololado
KØSID 65,792
WØCDP 39,988
KØTMM 11,696

Kansas
KØQEC 37,688
WØVFE 18,195
KØGIC 16,570
KØGZP 11,624
KØQGJ 6,444

Iowa
WØVXO 65,630
KØLUZ 64,330
KØAZJ 31,082
KØPTJ 18,573
KØGRS 18,194
KØOVK 11,841

Nebraska
KØQIX 31,190
KØOBF 30,902
KØMQG 21,227
W6CQF/Ø 12,707
KØPMB 9,097

Minnesota
WØYCR 58,482
WØPBI 38,663
KØIKL 25,296
KØQLM 16,606
KØSNC 11,859
KØRGP 2,274
KØSNG 542

Hawaii
KH6CJG 5,957
K7IXE/KH6 2,599
KH6CRU 2,112
KH6CTH 72

Alaska
KL7MF 4,115

Canal Zone
KZ5JL 1,588

Disqualified
VE2UN 125,888
VE3UOT 123,656
VE3DH 37,800
K4LTA 80,900

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VE3DU
VE6IN
W1EFW
W3MDO

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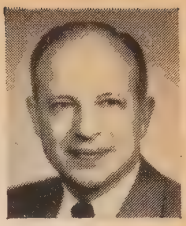

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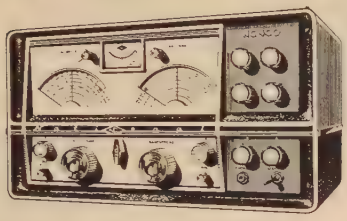

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For further information, check number 26, on page 126.

LETTERS [from page 32]

that they were victims of a hoax. They thought sure CQ was sponsoring it but I assured them that we had two issues of CQ but no reference to any contest for these areas.

Further research in QST for April showed that on page 128 there appeared an announcement of the Eleventh New Hampshire QSO Party. The rules of this contest proved that they could not possibly apply to activities of my fellow hams or the dates of the announced contest since the New Hampshire signals were not coming through on 6 meters.

Irving S. Reynolds
8 Van Cort Lane, Pelham Manor, N. Y.

17 ELEMENTS [from page 36]

When mounting the balun, make certain both ends of the balun point slightly downward so that rain (not in California, of course) will not make a hose of your coax. RG8U can be used, but RG11U gives a better match.

Performance

The performance of this little gem was so exciting that I decided I wanted the same thing for my 6 QTH high in the San Bernardino mountains. However here I wanted both horizontal *and* vertical polarization. Since wind velocities on the top of this 5800 foot hill sometimes reach 100 *mph*, it was necessary to use somewhat heavier construction materials but both horizontal and vertical antennas (each fed by a separate coax) were mounted on the same boom about 1" behind the other. No cross polarization has been observed.

On both the 17 element and the 34 element flip-flop, our standing wave ratio was less than 2:1 at worst and reached 1:1 at two places in the band. (See fig. 3.) As to why this should be is a mystery to the author except that a shorter

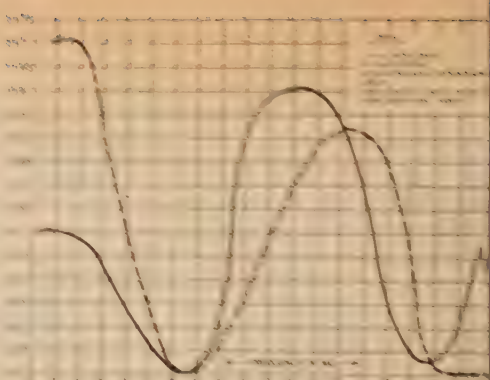


Fig. 3—SWR curves for the 34 element flip-flop beam discussed in the text. The vertical curve (the solid line) is identical to that of the 17 element beam at the home QTH.

than usual balun was employed as noted in fig. 1. Note how the *swr* graph forms a near perfect "W". The *swr* was read on two bridges —both sets of readings were very close but the author prefers the bridge shown in the November 1958 issue of *CQ* which uses but one dial.

Even though the elevation at the front door of the home QTH is but 2212 feet above sea level with an uphill chunk of real estate in every direction, we find ourselves able to communicate with almost all the stations our better situated friends can contact.

Time required to build the 17 element beam is about 4 hours and costs less than $5.00. The 34 element will take a little longer and may cost as much as $15.00.

QUADFAX [from page 33]

to be due to two factors, one of which is the lower angle of radiation obtained with a quad at relatively low heights. With a quad only ⅝ wave length above ground the vertical lobe is at about 30° whereas a yagi antenna lobe would be at a considerably higher angle. The Quad will perform quite well even at a quarter wave height above ground whereas, verticals, yagis and dipoles are quite poor at this elevation. The second factor which may account for claims of 10 *db* gain is the space diversity effect produced by the upper and lower wires. Under many radio propagation conditions this effect is quite an asset. You have no doubt heard of radio amateurs who have raised and lowered their antennas to obtain maximum signal strength under various propagation conditions. The Quad antenna in effect does this automatically over a quarter wave height.

There is much variance in articles and even in radio handbooks regarding the length of the Quad wires and the spacing between the radiator and the reflector. The length around the square has, however, been found to be quite nearly a free space wave length which is given in feet by 984 divided by the design frequency in mega-

cycles. The spacing between the wire squa may vary from about 0.1 wave length to 0. wave length without appreciably affecting gain. These spacings, however, result in a c siderable change in the feed point impedan

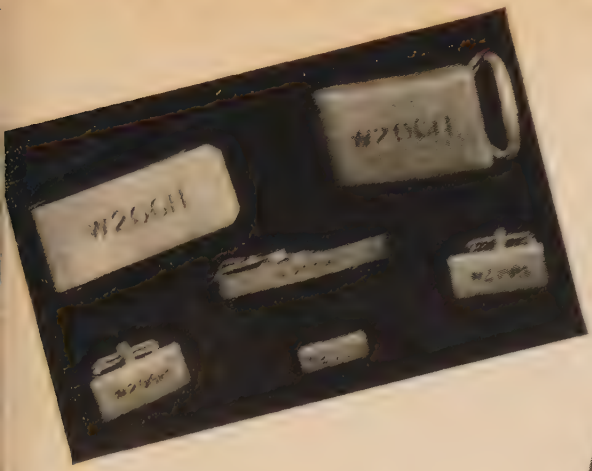
A spacing of $\frac{1}{10}$ produces about 50 ohms, $\frac{1}{1}$ about 90 ohms, and $\frac{1}{4}$ about 120 ohms with 75 ohms impedance occurring near $\frac{13}{100}$ spaci at heights of from ⅜s to ½ wave length abo ground.

Feed

Since the Quad is a symmetrical antenna should be fed with a balanced line to produ the expected antenna pattern. It can be f directly with coaxial cable with good resu but the pattern will be slightly distorted. Wi coaxial cable feed the use of a bazooka or oth unbalance to balance device such as the gam match is recommended.

The Quad antenna is quite broad band as as the amateur is concerned. The use of broa

CUSTOM STYLED GIFTS



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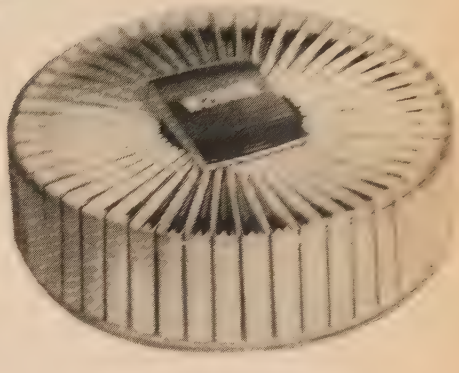

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Cuff Links G☐ S☐ Tie Bar G☐ S☐ Lapel Pin G☐ S☐
Match Books Gold☐ Silver☐ Green☐ Red☐ Hostess Set☐

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ADDRESS .....

CITY ..... ZONE ..... STATE .....

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banding techniques is hardly worthwhile as it will operate quite well plus and minus four percent from the design frequency. The front to back ratio suffers when it is operated much removed from design frequency but the degradation is less at the higher operating frequencies. The resonant frequency should therefore be chosen nearer the low frequency end of the desired band of operation. The size of the wire in the Quad is not critical from number 18 and larger. Mechanical factors are important in selecting the wire size to be used to give strength and minimize stretching of the wires.

Reflector

The Quad reflector is usually made the same size square as the radiator but with a tuning stub. I have found it advantageous to use a larger size square and thereby decrease the stub length to a few inches. This larger size increases the capture area and should give slightly greate gain. For example, a Quad constructed for 1 meters used a reflector 12 feet on each side an required only about a 3 inch shorted stub.

Tuning

The tuning of the Quad is best done by havin a nearby fellow ham put a steady signal on *horizontally* polarized antenna. The back of th beam is oriented at his antenna and the reflecto stub tuned for minimum signal. Trying to tun for maximum gain is a tedious task because th variation in signal strength is, "as broad as barn door." Furthermore, maximum forwar gain and the best front to back ratio appear t nearly coincide. Tuning any antenna is best don where it will eventually be used. However, th Quad can be tuned with the lower wires at hea height above ground without much change afte it is hoisted to its final operating position. ■

IN OUR OPINION [*from page 6*]

over just what they will and won't do. Seems this has been one of the most successful amateur affairs on the docket. As usual, the Dayton Biltmore hotel was literally overflowing with ham populace. Mobile whips dominated the scene in most parking lots and the amateur bands were well filled with show conversation.

Aside from the large displays of latest ham gear, the Hamvention also boasted a wonderful technical program. The following people were on the program: Gil Waite, K3AWI of Philco, Irv Strauber, K2HEA, SSB Editor of CQ, Bob Bean, W9BGZ of Northwestern University, A. Pichitino, WØEDX, Chief Engineer of E. F. Johnson Co., Earl French, W8ZOK, Urban Le Jeune, W2DEC, DX Editor of CQ, The North Jersey D XAssociation, Dan Marien, W8MXS, Maj. Mel R. Jones, W3DHJ, Jim Ricks, W9TO of Hallicrafters, Andy Andros, WØLTE, of Hy-Gain, Lloyd Root, W8HB, Ed Tilton, W1HDQ, VHF Editor, QST, Roger Mace, W8MWZØ of Globe Electronics, Larry Brandenberg, W8TEK, John Hull, W8RRJ of North American Aviation, Sam Harris, W1FZJ, VHF Editor, CQ, A. Henderson, W8WYL, Burt Jaffe W8CKW/K9BRL of Electrom Industries, H Shook, W8ZYW and C. Dew, of Ohio Bell Tele phone Co., Dick Jeffrey, W8GDC of Arm Mars, George Jacobs, W3ASK of the VOA an Propagation Editor of CQ, J. A. Hills, W8FYC and William I. Orr, W6SAI of Eitel-McCul lough Inc.

The ladies had a special program which in cluded a style show, social hour (with coffee and even some games. The Kitty Hawk roo of the Biltmore was the scene of a pleasan luncheon and the affair terminated with th Grand Banquet in the main and junior ballroom with Bob Zimmerman, W8DPW as MC. Bill Or W6SAI was the feature speaker at the dinner

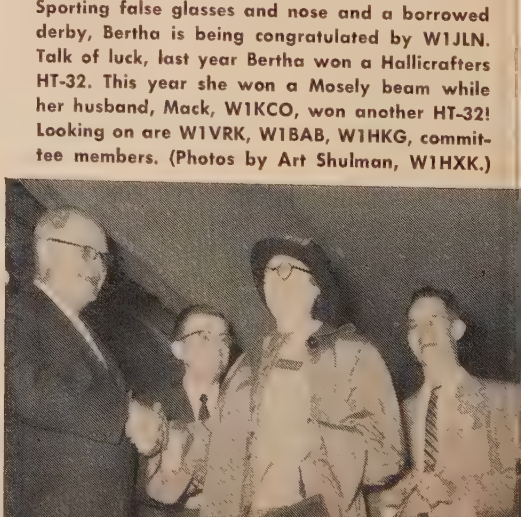
We had a wonderful time at this years ham vention and look forward to seeing you a again next May.

Quads

While at Dayton, we stopped by to see Aaro Self, W8FYR of CESCO. Aaron and I got talk ing about Quads and the controversy that exist

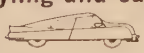
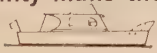
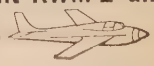
A view of a portion of the head table at the New England Convention banquet. Stacking it away are committee members Eugene Hastings, W1VRK; Eli Nannis, W1HKG; George Ringland, W1EYZ; a featured speaker and guest Father Lineham, head of the Weston Observatory of Boston College, and Ernie Coons, W1JLN, General Chairman of the committee. Also present was Gen. Griswold, KØDWC.

Having a good time is K1LDC, Bertha McCormick. Sporting false glasses and nose and a borrowed derby, Bertha is being congratulated by W1JLN. Talk of luck, last year Bertha won a Hallicrafters HT-32. This year she won a Mosely beam while her husband, Mack, W1KCO, won another HT-32! Looking on are W1VRK, W1BAB, W1HKG, committee members. (Photos by Art Shulman, W1HXK.)



HERE IT IS AT HARVEY

THE NEW COLLINS KWM-2 TRANSCEIVER

Distinctive modern styling and easy mobility make the lightweight KWM-2 an attractive unit for the CAR  **BOAT**  **AIRPLANE**  **or fixed station.**

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For further information, check number 27, on page 126.

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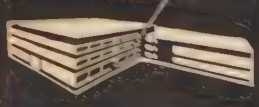

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Sensational new A/S "mobile" antenna package, Model MB-24, includes a 102" stainless steel whip for 27 mc (and can be cut to shorter lengths for other frequencies) plus double bumper mount. 20 feet of RG-58/U cable with PL-259 connector and a whip hold-down clip. Complete — nothing else to buy! No holes to drill! Ship. wt. 10 lbs.

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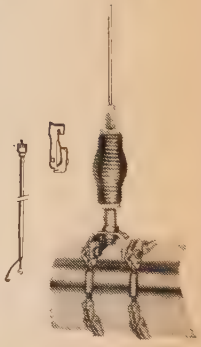

Amateurs and Citizens Band 24-50mc
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Citizens Band 18', 27mc
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Easy-to-install antenna of solid, rustproof aluminum for roof or side mounting. Jointed vertical radiator bolts to 2" dia. skirt. Underside of top radiator element accepts PL-259 connector, insert at top of skirt threaded to accept ¾" mounting pipe. Two insulating spacers included. No guy wires needed! Ship. wt. 7 lbs.

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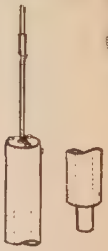

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For further information, check number 28, on page 126.

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Contains 90 double size pages of TV schematics covering over 600 frequently encountered model and chassis numbers of 20 manufacturers containing alignment data, schematics, waveforms, tube location guides, essential part numbers, operating voltages and other valuable servicing information.

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CQ Magazine
300 West 43 St., New York 36, N. Y.

Aaron has had so many people wanting the facts he has prepared a little paper which gives you just that. We are sufficiently impressed with this paper to reproduce it here where you won't miss it. To wit:

From the increase in inquiries since the publication All About Quad Antennas *by W [illegible] Orr, W6SAI, it is evident that there were a lot of people disillusioned about the gain figure of the quad antenna. Many exaggerated and false claims as to gain have been given out in the past ranging from 8.5 to 13 db for the one wave length driven and reflector array. The two frame one wave length array, as I have always advocated, produces a forward gain figure of 5.6 db or equivalent to a two element yagi. IN ALL OF THE EXAGGERATED CLAIMS AND FALSE PROPAGANDA, THE TRUE FACTORS WHICH INFLUENCE THE OUTSTANDING PERFORMANCE OF THE QUAD ARE NEVER CITED. Listed below are eight of the most logical reasons why the quad makes a good communication antenna:*

1. *Full wave element.*
2. *Increased capture area.*
3. *Combination of horizontal and vertical polarization.*
4. *Lower angle of radiation, approximately 5% over yagi.*
5. *Double voltage current cycle or greater voltage to current conversion.*
6. *Minus the inductive reactance encountered in tapped element impedance matching.*
7. *Greater overall efficiency as high as 85%.*
8. *No end effect. A BIG FACTOR.*

A simple explanation of end effect can more easily be explained by reference to a yagi or half wave element. At each end of a resonant half wave driven element there appears a voltage reinforcing the current. This voltage to current conversion percentage in its cycle is dependent on the overall constructional and electrical efficiency of the yagi. Only a percentage of the power supplied to the yagi is converted to radiating energy. In a sense this end effect may be further described as being similar to a loaded and resonated final amplifier. While there is X number of watts showing as input with relative output, there is always X number of watts input that is not used remaining in the tank circuit in circulating currents. It is therefore concluded that since the voltage lobes appear within the inner driven array the quad has no end effect and the radiation factor should be increased considerably.

DX [*from page 61*]

YA1BW	via DL8AX
YN1CI	via W8QHW
YN4AB	via K4ASU
ZA1KC	Box 42, Tirana, Albania
ZB1FA	via W2CTN
ZD1AC	via RSGB
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KWM-2 Transceiver	$1095.00
32S-1 Transmitter	666.00
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516E-1 12 V DC Power Supply	262.00
75S-1 Receiver	495.00
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Canadians: available from

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For further information, check number 52, on page 126.

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ZD2JKO	via W4MCM
ZE8JJ	via W6UNP
ZS3AH	Box 297, Windhoek, Southwest Africa
ZS3X	via W1DGJ
ZS7P	via W6BAF or 3650, Johannesburg, S. Af.
ZS7R	P.O. Box 98, M'babane, Swaziland
ZK1BS	via W7ZAS
4S7EC	Box 907, Colombo, Ceylon
4S7WP	via W3KVQ
5A2CV	RAF Stn., El Adem, PFPO 56, via London, England
9M2GR	J. G. Willis, Minden Barracks, Penang, Malaya

73, Urb

HAM CLINIC [*from page 65*]

current using R1 until the temperature rise is approximately 70°C above 25°C ambient air temperature. The ½ wave resistive load rating is 75% of the *dc* amperage rating. For ½ wave capacitive load rating it is 57½ of the *dc* amperage rating.

Figure 4 shows how the reverse test, to determine PRV (peak reverse voltage rating), is made. If the actual avalanche (break-down)

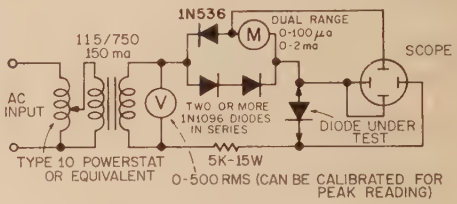


Fig. 4—Set-up for determining the peak reverse voltage rating of a diode.

point is not required, the scope may be omitted. Increase the voltage until leakage reads about 25 microamps at room temperature (ambient). Read the *rms* volts and multiply by 1.414 to obtain the practical operating peak volts. When you desire to know the avalanche point, set meter (M) on high scale, and using the scope, increase the voltage until a sharp break on the scope trace is evident. Then read the *rms* voltage at the point where the trace just starts to break. Then multiply by 1.414 to get the actual breakdown voltage.

Thirty

Thank you for following HAM CLINIC, we hope that you continue reading it. You can rest assured that every effort will be made to bring you the information you can use in the pursuit of the very worthwhile hobby of amateur radio. If you have some ingenious technical tip let us have it to pass on to brother hams. For this month then, 72, 73 and 75.

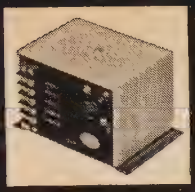
Chuck

SB [*from page 79*]

come home to Bob, ex-F7GG, who is now W4ANZ/5 in San Antonio, Texas. . . . At long last, Henny, WA2DLK, XYL of Rauol, K2AOS, has caught the fever. Licensed for ten months, Henny only operated when Rauol was overseas but the bug bit and she is now a regular on 20

[*Continued on page 110*]

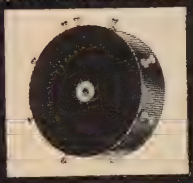
TRANSISTORIZED D. C. POWER CONVERTERS & INVERTERS



These small lightweight units, feature low current drain, high conversion efficiency, ruggedness and no moving parts. They provide trouble free, economical operation of communications equipment and other related devices. Ideal for use in mobile, marine, aircraft, Citizen's Band and amateur equipment.

TRANSISTORIZED CONVERTERS AND INVERTERS 12 TO 14 VDC INPUT				
MODEL	TPC-25W	TPC-60W	TPC-120W	TPI-25W
RATING	25W	60W	120W	25W
PRICE	$32.50	$48.50	$57.50	$32.50
OUTPUT Voltage Current	250V 100ma	300/150V 200ma total	500/250/—60V 200/100/10ma	115/26VAC 25W—400cy
INPUT No Load Full Load	0.5 amp 3 amp	1 amp 7 amp	1.5 amp 12 amp	0.5 amp 3 amp
REGULATION Full Load/No Load Full Load/½ Load	86% 92%	88% 93%	85% 91%	70% 85%
OVERALL DIMENSIONS Width Length Height	3 in. 4¾ in. 3⅛ in.	4¼ in. 5¼ in. 3¼ in.	4¼ in. 5¼ in. 3¼ in.	3⅜ in. 5 in. 3¼ in.

Precision wound Toroidal Transformers. For use in construction of Transistorized Power Converters and Inverters or as a replacement part. Encapsulated for ruggedness and long life. Easy to install and wire. Designed for operation in ambient temperatures from —55° to 130° C.



TOROIDAL TRANSFORMERS FOR 12 TO 14 VDC INPUT				
MODEL	TT-25W	TT-60W	TT-120W	TIC-25W
RATING	25W	60W	120W	25W
PRICE	$8.10	$11.25	$15.25	$14.75
TRANSISTOR POWER RATING	3 amp	6 or 12 amp	12 amp	3 amp
OUTPUT Voltage Current	250V 100ma	300/150V 200ma	500/250/60V 200/100/10ma	26 & 115 VAC 400cy

B&W Barker & Williamson, Inc.
Bristol, Pa.

For further information, check number 22, on page 126.

"All About Cubical Quad Antennas"

William I. Orr, W6SAI, 3A2AF

Here it is! The all-new Handbook with the full, complete story of the famous Cubical Quad antenna! Taking the amateur world by storm, the Quad is "topic number one" whenever DX-minded hams discuss antennas.

All About Cubical Quad Antennas, by William I. Orr, W6SAI (author of the famous *Beam Antenna Handbook* and editor of the *Radio Handbook*) covers the Cubical Quad antenna from *A* to *Z!* Complete in one volume, this informative, non-technical Handbook includes the history, theory, design, construction, and adjustment of single, multiband, and multi-element Quad antennas.

Shown for the First Time is the new *X-Q* Quad antenna which provides a big boost in signal gain and superior performance over the usual Quad! Also included in this new Handbook are complete construction data, dimension charts, and installation information *that will make your Quad work!*

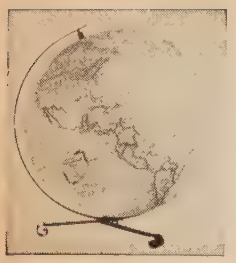
Shown for the First Time is the new *Tri-Gamma* matching system utilizing only one feedline for a tri-band Quad! This new device gives you a compact, efficient three-band beam antenna using one feedline without the traps, coils, or other "gadgets" necessary for the usual "three bander" beam!

All About Cubical Quad Antennas, by W6SAI provides the only source of information about the popular Quad antenna. Gain charts! Polar patterns! Angle of radiation charts! Complete tuning information! The *complete* story of the Cubical Quad antenna!

All About Cubical Quad Antennas is available at your local radio dealer during the first weeks of December. For quick delivery by mail from the printer, order your copy direct from: Radio Publications, Inc., Wilton, Conn. Price: $2.85 plus 15¢ to cover cost of packing and shipping. ORDER YOUR COPY NOW! ■

For further information, check number 23, on page 126.

THE CQ HAM MART



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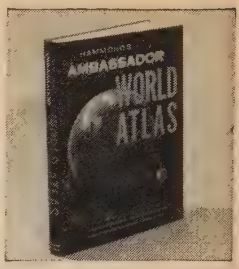

COMMAND SETS

This IS a collection of reprints, containing all of the available information on the conversion of the popular "Command" transmitters and receivers into good ham transmitters and receivers. Invaluable for Novice, Technician, General, Advanced and Extra class operators. 136 fabulous, amazing terrific pages for only $1.50 postpaid.

MOBILE HANDBOOK

Anyone who tries to go mobile without getting this book should register for a sanity hearing. Bill Orr, W6SAI has put everything you need to know in this book. Build-its by the dozen... solutions to ignition problems, keeping the battery charged, noise... only $2.95 postpaid.

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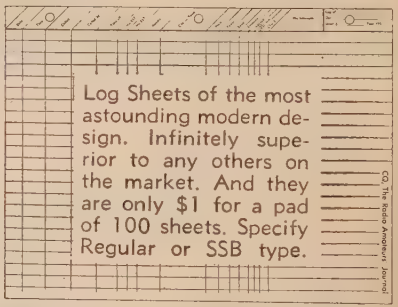
Learning code is a snap with this record. Speeds from 3 to 16 WPM, depending upon turntable speed. This 12" LP record has on it all you need to learn the code for both the Novice and General License. $3.50 each.



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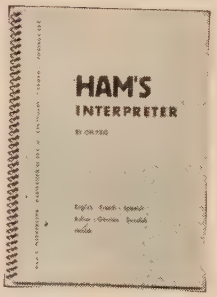
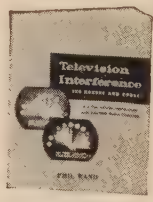
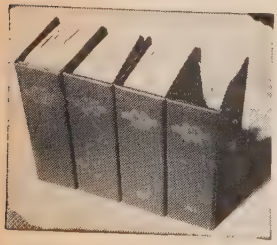




TVI HANDBOOK

WIDBM's newly written TVI book (2nd edition) covers all aspects of curing TVI from both the Ham's viewpoint and that of the TV viewer or the TV serviceman. It includes 2- and 6-meter TVI as well as Citizen's Band, Industrial, Medical and Utility TVI. Profusely illustrated with diagrams, photos, charts, tables and FCC regulations pertaining to radio and television interference. Price $1.75 postpaid, USA, $2.00 Foreign.



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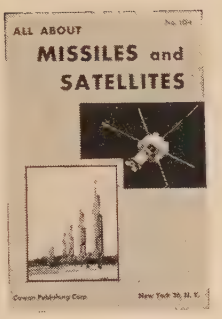
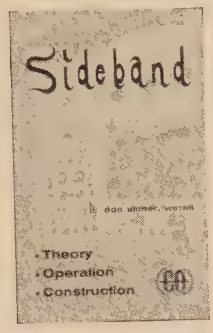
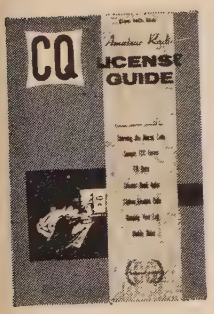


Here's a book, written in down-to-earth language, which answers questions on missile maintenance, fire control, flight control tracking, testing, fuels, payload and many other achievements in rocketry and space for both scientific and military applications. Also, featuring the most up-to-date "Directory of 38 Most Popular Missiles and Their Photos," (supplied by Department of Defense) as well as a "Glossary of Missile Terms." $1.50 per copy.

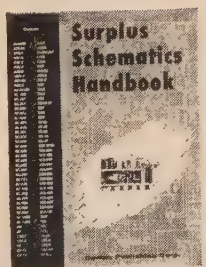


SIDEBAND HANDBOOK

Written by Don Stoner, W6TNS, was almost one full year in the preparation of this terrific volume. This is not a *technical* book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff, gadgets, receiving adaptors, exciters, amplifiers. Price, only $3.00.



212 pages of everything the Amateur must have to get his license and progress toward the general class ticket. Plus many additional pages of vital information for the ham operator. All this for only $2.50.



This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available. Trying to figure out the circuitry cold turkey can be many times more difficult than the most involved puzzle, and purchasing a single instruction book can run as high as $3.50. Why knock yourself out when you can have a book with complete coverage on hand in your library? All this for only $2.50.

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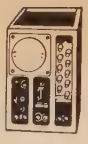

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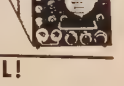

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[*from page 106*]

meters. . . . Although the first week of his vacation wa marred by bad weather, we imagine that Sam, W3HN welcomed the chance to stay indoors and ham. . . . Doug K2EG, keeps 40 meters hopping during the daytime aroun 7210. . . . John, W2WJS, has been having a ball wit his KWM-1 and *indoor* dipole for the past two years wit 80 countries confirmed.

PROPAGATION [*from page 81*]

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Western USA To:

	10 Meters	15 Meters	20 Meters	40/80* Meters
McMurdo Sound	11A-1P (1) 1P-3P (2) 3P-5P (1)	11A-1P (1) 1P-3P (2) 3P-5P (3) 5P-7P (2)	4P-5P (1) 5P-7P (2) 7P-8P (1)	7P-9P (1) 2A-6A (1)

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Circuit Forecast To Open:

(1) Less than 5 days during each month of forecast period.

(2) Between 5 and 11 days " " "

(3) Between 12 and 22 days " " "

(4) On more than 22 days " " "

* Forecast for 80-Meter openings. Openings on 160-Meters may also occur during this period on nights when atmospheric noise conditions are exceptionally quiet.

A-A.M. P-P.M. N-Noon M-Midnight

The CQ DX Propagation Charts are based upon a CW effective radiated power of 150 watts at radiation angles less than thirty degrees, and are centered on the Eastern, Central and Western areas of the USA. See the May issue of CQ for further details concerning the use of these charts. The DX charts are valid through August, 1960. These forecasts are based upon basic ionospheric data published by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

sphere present a very complicated pattern, this pattern must be well understood in order to achieve the best use of radio communications.

Information about the constantly changing ionosphere is collected by the Bureau's Central Radio Propagation Laboratory (CRPL) at Boulder, Colorado. CRPL uses this data, obtained from ionospheric sounding stations throughout the world, to prepare world-wide charts of basic ionospheric predictions. These basic predictions are issued monthly, three months in advance. From this data, users of the high frequency radio spectrum can predict propagation conditions for specific circuits. The propagation forecasts appearing in this column are derived from the basic predictions published by the CRPL.

When the Bureau of Standards began monthly propagation predictions in 1942, they were based on information from only three ionospheric sounding stations. Since then, data available for analysis have increased vastly. Information was obtained by approximately 50 stations at the end of World War II, by 78 stations at the beginning of the IGY in 1957, and by a world-wide network of 161 sounding stations during the IGY. With this mass of new ionospheric data on hand, the CRPL has been able to revise the basic prediction charts in such a manner that the present charts are more accurate than ever before. This improved accuracy in the basic data will, no doubt, lead to more accurate results in the prediction of conditions on specific circuits. The Bureau expects that the accuracy of the present basic predictions may be still further

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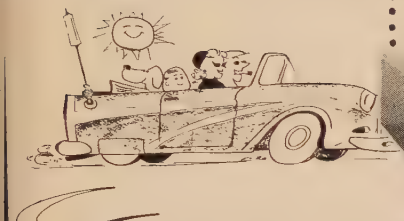

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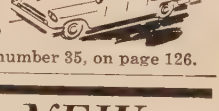

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improved in the near future as additional ionospheric data is obtained from earth satellites and other types of space vehicles.

73, George, W3ASK

SEMICONDUCTORS [*from page 86*]

prices, the 1N2939 (formerly the ZJ56), the 1N2940 (formerly the ZJ56A), and the 1N2941 (formerly the ZJ56A-4.7), now cost OEM $7.50, $5.95, and $4.95 in production quantities. GE has also reduced prices on 39 of their low current silicon rectifier by as much as 50%. New from GE is their high-speed germanium NPN transistors, types 2N1288 and 2N1289. These transistors have an alpha of 60 *mc*, a beta of 150, and are priced around $5.00 in large quantities. Eight models of a new silicon controlled rectifier are now available from General Electric. They differ by peak inverse voltage ratings and range from 25 volts to 400 volts.

Motorola, Inc., has added a new 15 ampere power transistor series to their line. Designed for high current switching, *dc* to *dc* converters and audio applications, these units are available with breakdown voltages between 40 and 120 volts. The 2N1549 through 2N1552 have a gain of 10-30, the 2N1553 through 2N1556 are 30-60, and the 2N1557 through 2N1560 are rated between 50 and 100. For ultra high speed switching applications consider the new Motorola 2N705 millimicrosecond transistors. These amazing units have a 300 *mw* dissipation and can switch in the same time it takes light to travel 5 feet! Lower thermal resistance is claimed for Motorola industrial power transistors. They are now rated at 0.6 to 0.8°C per watt from the previous 1.2°C/w.

Philco Corporation has just announced a new series of SAT-Surface Alloy Transistors. These silican devices are rated at 150 *mw* dissipation and operate as high as 140°C. The 2N1118 is a high frequency unit with an alpha of 15 *mc*. The 2N1119 is a silicon high speed switch, and the 2N1428 and 2N1429 are general purpose high frequency transistors rated to 18 *mc*.

Radio Corporation of America is expanding their gallium arsenide semiconductor devices. They are now delivering to the Air Force GA diodes capable of operating two-and-a-half times the temperature of boiling water. These devices will be used in high temperature aircraft and missile applications. Also newsworthy is their new GA transistor, shown for the first time at the Dayton National Aeronautical Electronics Conference. The transistor, a developmental diffused-junction drift-field, was demonstrated in an oscillator application. These transistors are superior to silicon and will operate at temperatures exceeding 250 degrees C, and have an alpha cutoff of over 100 *mc*.

Sylvania has jumped on the tunnel diode bandwagon with a unit which operates to 4 *kmc*. The device has a ratio of 5 to 1, a peak current

[*Continued on page 114*]

TEST EQUIPMENT

Signal generator, Ferris 18-B, 18-155 M.C.	$45.00
Navy-R.C.A. 3 inch scope	29.00
Beat Freq. Osc., G.R. 700 A, 50 Cy. –5 M.C.	95.00
Freq. Meter, Navy LM type, with Mod. & Orig. Calib. book, like B.C. 221 except no battery box	49.00
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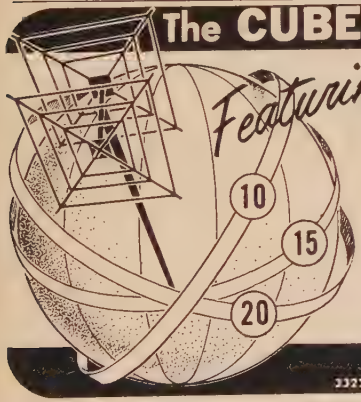

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Other Models from $49.50

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For further information, check number 37, on page 126.

NEW Especially Designed for Single Side Band! HIGH VOLTAGE POWER SUPPLY

DELIVERS 3500 or 4200 VOLTS DC AT 500 MILS

The high-voltage power supply you've been waiting for! All the power you'll ever need—even for that Alaskan Kilowatt! Especially designed for single side band by one of the leading manufacturers of precision electronic equipment since 1947...No transients due to poor dynamic regulation...No chokes. Write for complete descriptive literature.

MODEL 65A — 4.2 KV — $365.00
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Send check or money order only—no C.O.D.'s

Amateur Division

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Specifications:

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OUTPUT: Model 65A—4200 V. DC @ 500 mils, cont. duty
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RIPPLE: Nom. 1% at full load
WEIGHT: Model 65A—150 lbs. net
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SIZE: 17″x17″x8½″ high

For further information, check number 38, on page 126.

a Ham Tower anyone can afford—

THE LEADER-40

Here is a sturdy, low cost, quality tower that is ideal for novice or technician. The same E-Z WAY standard of quality found in our higher priced towers has been incorporated into the LEADER-40. Cranks up to 40' - down to 20'. Equipped with winch and safety rest. Will support 2M, 6M, or Quad unguyed. Mast extra.

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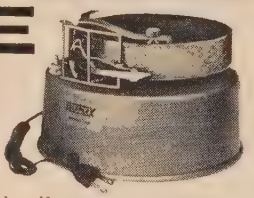
TELEPLEX METHOD trains you to hear Code signals just as you hear spoken words — because it teaches Code SOUNDS and not dots and dashes. Thirty words with ease . . . fifty words not unreasonable! Starts beginner or advances your present speed. Try it for yourself and compare with anything else. 40 years experience teaching Code have made the Teleplex Method far superior to all the cheap "gimmicks" on the market. **Write today for details and free trial.** You be the judge! (Improved cabinet design allows new low cost.)



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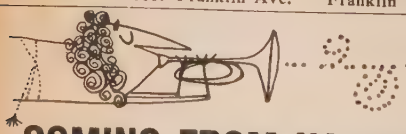
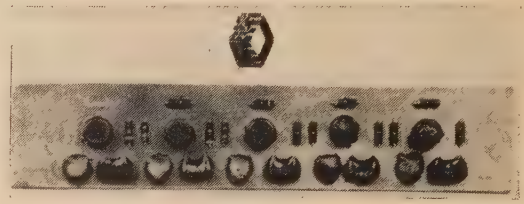


COMING FROM NATIONAL!
SEE INSIDE BACK COVER AUGUST ISSUE

up to 4 *ma*, and a minimum current at approximately 350 *mw*. Also new is their 2N705 and 2N710PNP diffused base germanium mesa transistors for high speed switching applications. The six new microwave mixer diodes and broadband mixer diode type 1N286A will interest radar engineers. At the Kâ band (35 *kmc*) an overall noise figure of 9 *db* is claimed. Another first for Sylvania is their pancake transistor



An interesting comparison of the new Sylvania microminiaturization technique compared to a standard etched circuit board. The module measures ⅜" high and less than one half-inch square!

package which reduces the size and weight of conventional units by one-tenth. The device is only one twentieth of an inch high by 0.25 inches indiameter. In the field of microminiaturization, Sylvania has just announced a technique for packaging electronic circuits on stacked wafers, each smaller than a postage stamp. Of interest to many amateurs is their radio transmitter only one inch high (see photo).

Texas Instruments, Inc., have just introduced a new product, their Model 530 tunnel diode curve tracer. When a tunnel diode is connected to the tracer, and it in turn is connected to an oscilloscope, the characteristic I/V curve is displayed (see photograph).

73 De Don, W6TNS

[*from page 89*]

W3HBA	532	K5OCX	276
W3CDG	531	K5LGH	52
K3GQW	400	W5RJH	Conf
K3ALL	252		
K3KMA	1		
		K6SXA	3656
		K6CJF	1035
W4CHK	2440	WA6FKF	700
W4HQN	2175		
K4RIN	1620		
K4RAD	1531	W6JVA	467
W4JUJ	156	W6RCV	270
K4TEA	1017	W6PTF	195
K4BVD	675	K6SXX	110
W4KMS	562		
K4EPI	580	W7POU	807
K5SVC/4	350	W7HKT	693
K4UJS	281	K7APJ	375
K4DRO	206	K8MHB/7	Conf
K4GPH	192		
W4KPB	90	K8GWK	1823
W4ZQK	35	W8NAN	1750
W4RXI/4	20	K8GHG	1690
		K8GAB/8	697
		W8QHW	658
W5WZQ	2380	W8YGR	472
W5DQK	2175	W8DM	420
W5VZU	1312	K8KVV	300
K5UYF	1265	W8FIN	11
K5LXZ	675		
W5AWT	320	W9DYG	2928

W9LNQ	2437	KØTYO	Conf
W9BZW	2170	VE1EK	195
K9ICG	1856	VE2UN	1687
K9DWG	1383	VE2AQO	520
W9GWO	1100	VE2IL	918
K9ASF	984	VE3RN	742
W9CLH	862	VE3DDU	495
W9YDQ	825	VE3DYJ	487
W9NLF	736	VE4XO	1596
K9PJN	660	XE1PJ	60
W9QWM	607	LA6U	7
K9HRC	472	F9DW	37
K9OWF	373	SP6FZ	120
W9CHD	308	OZ3GW	1
K9QFR	123	DL1YA	6
W9FCX	Conf	G2WQ	151
W9HUA	Conf	PAØVB	62
K9IWS	Conf	OH3TY	5
K9MBW	Conf	OH2RD	1
KØPIE	2662	HB9TT	15
WØVKB	1468	IT1AGA	178
KØUAF	1050	FA8CR	31
WØKCG	855	PY4AO	30
KØQLY	440	JA1ACA	20
KØQWY	400	JA1CO	5
KØDYR	336	JA4YC	3
WØMCX	195	JAØIB	1
WØDIB	108	JAØML	1
KØRHE	43		

Silent Keys

From W6QMO, Jeri, comes sad news that K6PQG, Barbara Yoacham, was killed instantly in a head-on collision on April 2nd. At the time Babs was route manager for the San Francisco Section and also ORS. She was affiliated with NCN for the last three years and held NCS and other spots in that net. Working c.w. exclusively, K6PQG had many friends on 80 and 40 meters. She leaves four children.

And from KØEPE, Mart, we learn that KØBCQ, Carolyn Owen, of Denver joined the Silent Keys on April 8th, after a long illness. Carolyn was charter member #2 of the Loaded Cloths Line YL Net, and will always b remembered by her many friends in Ham radio.

August CQ

This space in the August issue of *CQ* will be devoted to a feature article by K9AMD, Carole Hoover, while yours truly is off to take in the 3rd International YLRL Convention at Cambridge, Mass. See you in the September issue with a full report on the big doings!

33, Louisa, W5RZJ

NOVICE [*from page 93*]

Ron Tregl, 231 Lurgan Ave., Shippensburg, Pa., just received his ticket but he was too excited to tell us what his call letters were! Anyway, Ron will be making his presence felt with a Globe Chief Delux, an NC-60, and an 85' wire. Look for him on 80 and give him a fling at RCC.

Bill McFarland, **K4PVZ**, 1919 Holland Ave., Burlington, N. C. hates to give up his Novice activities, but the General ticket finally came through for him. In six months of operation as a Novice, Bill filled up an ARRL log book and made WAS, along with sending more than 400 QSL cards!

Once again, "dots it" for another month. Don't forget to keep sending the letters and photographs. I'll see you back at the same stall next month.

73, DE—Don, W6TNS

EDDYSTONE

GEARED SLOW MOTION DRIVE
For Amateur Radio & Communications
RECEIVERS & TRANSMITTERS

A high grade assembly, flywheel loaded, manufactured to fine tolerances, provides a smooth positive drive with a reduction ratio of 110:1. The vernier with its 100 divisions rotates 5 times for one pointer traverse, giving 500 divisions with positive reset readings and no backlash. A cam adjustment on the vernier assures correct zero setting. A spring loaded jockey arm maintains tension of the pointer drive. Overall dimensions 9 3/16" x 5 3/4".

PRICE $15.00 NET
Postpaid

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Birmingham, England

DISTRIBUTED BY
BRITISH RADIO ELECTRONICS, LTD.
1833 JEFFERSON PLACE, N.W. WASHINGTON 6, D. C.

For further information, check number 40, on page 126.

TECHNICAL MANUALS COMPANY
515 Lafayette St., Utica 4, N. Y.
Partial List of Manuals

TM-11-827 Radio transmitter BC-447A	$4.00
TM-11-836 Radio transmitter BC-339—A to M	4.00
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TM-11-885 Radio Receivers R-140/FSM-1 (National HRO Series)	4.00
TM-11-898 Radio Receivers R-108/GRC—R-109/GRC—R-110/GRC	4.00
TM-11-1320 Radio Set SCR-627A (BC-982—985—986—1227—RA-67—107—PE-138—PE-139	5.00
TM-11-1415 Radio Equipment RC-127A—(BC-1293—1-221—1-222—1-233—BC-1267—-RA-105A	4.00
TM-11-1570 Radio Set SCR-270, BB to MA w/console	4.00
TM-11-2607 Radio Transmitter BC-400H	4 00
TM-11-4701 Rectifiers RA-34, A to J	4.00
Handbook Maintenance Instruction Models AN/ARP-1—AN/SPR-1	5.00
Instruction Book—Shipboard Panoramic Set RDG	5.00
Instruction Book -Portable VHF—Radio Transmitting Set AN/MAW-1	5.00
Handbook Maintenance. Radio Set SCR-645A—(BC-639-624-625—687—RA-42—PE-94-100—JB-45—RC-93-213)	4.00
Operating Institutions. Radio Set AN/ARN-14D	5.00
Instruction Book—Navy Model BN-1 Equipment	5.00
Maintenance Instruction—AN/APA-10 Pan Adapter	4.00
Maintenance Instruction—AN/APA-38 Pan Adapter	4.00
Maintenance Instruction—Radar Beacon AN/APN-11	7.00
Operation & Maintenance—Test Set 1E-19A	4.00
Maintenance Instructions—Test Oscillator—TS-47/APR	5.00
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Send Your Requirement for Others Not Listed

BC-603 CONVERSION

BC-603 Conversion article (Sept. & Oct., 1958 CQ) Reprints available at 50¢ per set.

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NEW!

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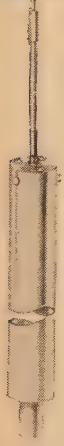

MODEL M-39 For 10 meter

Ideal for fixed station use, this omni-directional coaxial antenna lowers angle of radiation and offers a low standing wave ratio. Built for operation with 52 ohm cable. Antenna is comprised of a ¼ wave length, 8¼ foot jointed solid aluminum radiator bolted to an 8¼ foot long, 2 inch diameter, ¼ wave length aluminum skirt. Radiator element accepts PL-259 connector. Insert at top of skirt is threaded to accept ¾ inch I.P.S. mounting pipe.

ONLY..... **$13.30**

MODEL M-40 For 6 meter

Has same general construction features as Model M-39 except the radiator and skirt are each 4¾ feet long.

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Just two of over 200 popular Antenna Specialists models available at your local distributor.

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For further information, check number 41, on page 126.

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- Single Feed Line
- Aluminum Alloy End—Center Spiders.
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- No Stubs to Tune.
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- Aluminum Boom With Hardwood Insert.
- No Misalignment of Quads.

Write for Free Brochure.

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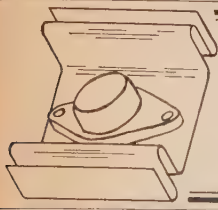

ANODIZED HEAT SINKS

For diamond shaped power transistors

Mounts in 2" x 2" area

8 square inches radiating surface

With socket & hardware—2/$1.00 Ppd.

BARTON RADIO SPECIALTY COMPANY

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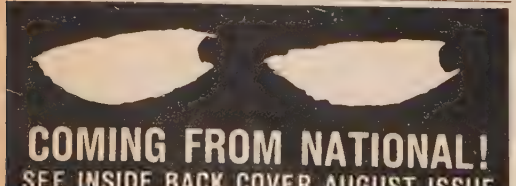

CONTEST CALENDAR [*from page 95*]

Corrections

In the 1959 CQ WW DX Phone Contest results published in May, the following errors were made: In the Top Five box (page 46) HZ1AB was listed as HZ1AZ; VE3PV (page 49) was listed as VE3PY. Sorry.

73 for now, Frank, W1WY

VERTICAL DESIGN [*from page 50*]

line resistance? In that case we turn the network around and the antenna gets connected across the condenser and the coax gets connected in series with the coil. It is just that simple. Now the question invariably arises, why go to all the calculation trouble? The answer is as simple as the question,—L networks do not lend themselves to "cut and try" approach and you could spend endless time with it and not know when you were getting close, and if you got the proper answer it would be the rankest kind of coincidence. Another question will arise; when the difference between the antenna resistance and the feedline resistance in the example is so small, why go to the trouble of working up a matching L network? The answer is that you probably would not. You would accept the minor mismatch and be happy with it. The example was chosen to show the procedure, not the actual magnitude of the results. On the other hand, take the case of operating the same before mentioned antenna on the 40 meter band or on a MARS frequency of 7832.5 *kc*, where the measured antenna resistance was on the order of 100 ohms. In this case, two difficulties arise; first the mismatch becomes significant and second the loading problem may be troublesome with certain transmitters depending on the length of feedline in use and also depending on whether you are using a pi net coupling system. The pi net coupling system is simplicity in itself as long as it works into a purely resistive load, but with a reactive load it may at times get "sticky."

Another question which is sometimes asked is whether the radiation pattern is modified by a non-symmetrical ground system. Probably there is some theoretical distortion but for all practical purposes it may be neglected. Another afterthought regarding the ground system is, do not put the antenna up on the roof and the radial system on the ground and then complain that the system is no good; it will be as good as the intelligence applied to the installation. If the two are widely separated then the distance from the bottom of the antenna to the ground is in fact part of the antenna, and if you tie the feedline to the bottom of the antenna you are in effect "feeding it off-center." One additional admonition regarding the use of the bridge for measur-

[*Continued on page 124*]

LIGHTNING [*from page 38*]

won't do much good in withstanding the awful energy in the bolt. If you happen to be unlucky enough to live in a lightning area, the wise and safe thing to do is to ground your antenna and *disconnect* it from your equipment *before* the storm starts! Come what may, your valuable station equipment is protected even if your antenna suffers a direct hit. Disconnect your feedline and drop it out of the window, or let it dangle and touch the ground (fig. 6).

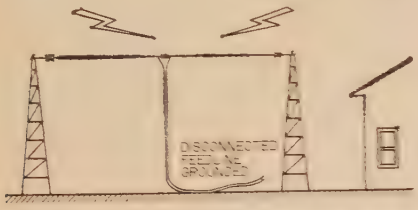

Fig. 6—Safe and simple lightning protection is to disconnect your antenna feedline and let it drop on the ground. The station is completely isolated from the antenna, and you can watch a lightning storm completely at ease!

Your station will be physically separated from the attractive (to the lightning) antenna, and you can breathe in peace while the storm flashes about you!

Whatever form of lightning protection you choose, DO IT NOW! When the next storm comes along it may be too late! ■

THE ULTIMATE ANCHOR [*from page 47*]

member is to distribute the stress over as many blocks as is possible. (The cracks in the wall, which are evident in the photograph were there before the tower was even dreamed of, and are not a consequence of its erection.) Now center and screw the spacer on top of each outside support member. This spacer prevents the tower from mutilating any overhang of the roofing material. The next step involves laying the tower out with its base at the foot of the garage wall and having several willing helpers assist in raising it to a vertical position against the spacers. The mechanics of this depend on the amount of help and local conditions, so we leave it to your yankee (except in the south) ingenuity. While your husky cohorts hold the tower vertically, slip the clamping member onto the rods and tighten them securely in place. While your perspiring helpers are quaffing the amber nectar you bribed them with, you can paint over the exposed rods, nuts, and washers.

Experience with our employer, Mother Bell, has instilled a healthy respect for lightning, so we have connected a ground rod to each leg of the tower. The lower resistance path to ground you can offer to lightning, the better protection you afford yourself.

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WITH **Built-in Power Supply**

Designed to operate in 1.8 to 30 mc. range. NO EXTERNAL D. C. POWER NEEDED! Just plug into any regular 120 v. A. C. outlet. About 15 watts power required.

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For further information, check number 42, on page 126.

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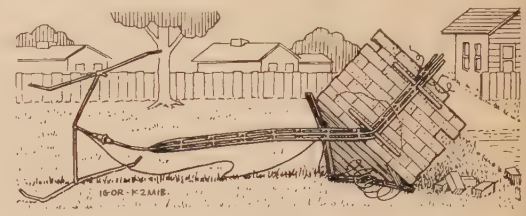
COMING FROM NATIONAL!
SEE INSIDE BACK COVER AUGUST ISSUE

I don't advise this method of mounting be used on a wood frame garage because of the stresses and drumming effects of high winds. Over two years of use has proven our ideas to be sound, both structurally and electrically. I hope the "Ultimate Anchor" will solve one of your problems; and if the neighbors complain, tell them it is the best lightning rod in the neighborhood! ■



40 MTR 3 ELEMENTS [*from page 46*]

condenser with close spacing can be used.

On a large antenna such as this one is constructed it would be almost impossible to reach the adjustment out on the element, if it were a gamma match. Adjustments on the Omega match were all made from the center of the tower.

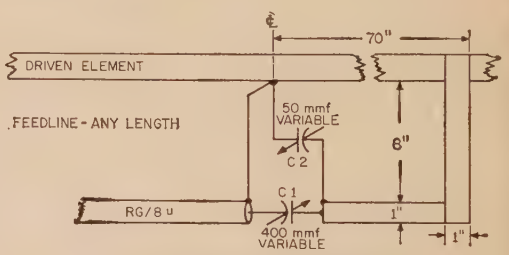


Fig. 4—Gamma match dimensions.

I feed the beam with RG8/U through the Omega matching network. The beam weighs approximately 130 pounds, and is rotated with a Prop-Pitch motor. The elements resonate at 7250 *kc* at a height of 70 feet. The director is 63′ 9″, driver 65′ 11″, and reflector 69′ 4″. SWR at the operating frequency is 1.1 to 1; at the upper edge of the band it is 1.2 to 1; and at 7100 *kc* it is 1.35 to 1.

The Gamma Rod is one inch in diameter and shorted to the driven element at 70 inches. The Omega condenser is set approximately 50 mm. The Gamma condenser at 400 uuf.

Conclusion

Checks on the air prove the beam was really a worthwhile project. The f/b ratio of the beam is approximately 25 *db*. The most objections the fellows have about this beam is that it cannot be put up on a small property; the turning radius being nearly 35 feet. Also, it does require a good husky tower. Even at this it was fun to build and has proven its worth on the 40 meter band. If you have questions, I am on 7296 *kc* nightly. ■

HALO [*from page 43*]

make a good solder joint so that coil "B" is an extension of "A" and the two coils are now in fact one coil. Solder the outer braided shield of your coax feed line to the center of coil "A". Connect the coax center wire to the coil about in the position shown in the diagram.

Now connect an *swr* bridge in your feed line. Adjust the capacity adjustment in your halo plates for minimum *swr*. This adjustment is quite critical and very important. Be sure to stand away from car when taking readings and be sure the halo is mounted on your car exactly as it will be when you are in motion. Changing position of halo on the car so much as an inch will throw it off considerably.

After getting the *swr* down as much as possible with the halo adjustment, try connecting the inner wire of the coax to different points along the coil and solder it permanently to the point where you find minimum standing waves. Your match will now be very good but if you want every ounce try adjusting the coax shield each way from the point it was first soldered. Although you connected the shield to what is the physical center of the "A" coil the electrical center may be a bit one way or the other. Solder shield to where you get minimum *swr*. If you don't have an *swr* bridge you can use a field strength meter and make all of these adjustments for maximum field strength.

In conclusion I hasten to point out that I claim this 9 *db* increased signal over the whip while working halo to beam. Perhaps if the receiving antenna were vertical the situation would be reversed, however since 99% of the contacts I have made have been to home stations using beams or to other mobile units using halos, I feel now the halo is worth keeping on the car. ■

15 METER BEAM [*from page 41*]

ing straight up. To this top end we attached short pieces of guy wire while the other end of the guy wire was attached to the ends of the boom. This served to keep the boom from drooping under element weight and gave additional strength to our beam. The bottom end of our vertical section has an expandable coupler which allows it to slide down over our mounting stub. A pin is placed through the coupler to keep it from turning.

Performance

As far as results go: we were well pleased to work KC4-land while the beam was on the house. Running 100 watts on AM we managed to get a 59 report. Since that time the beam has been used over a year, and we have received favorable reports on phone and CW in all parts of the world. ■

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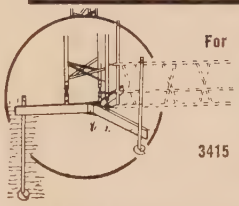

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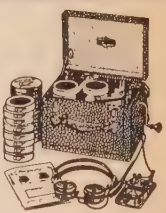

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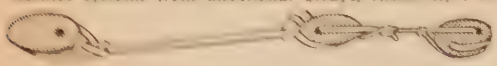

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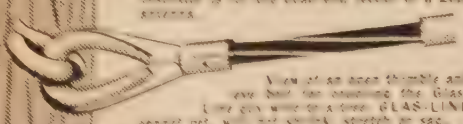

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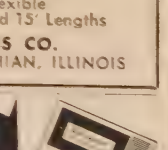

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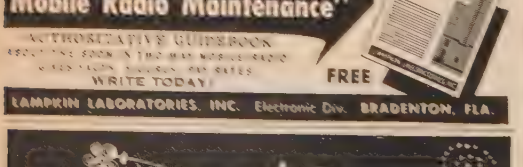

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WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft, Box 399, Mount Kisco, N. Y.

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WANTED: Motorola, Link or RCA 12V mobile equipment. Units must be complete, 30-50Mc. State condition and price. W4RRH, Box 143, Morganton, N. C.

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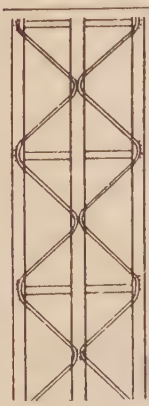

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SELL OR TRADE: EICO HF20K amplifier, Heath AM tuner, VOX and Q-multiplier; send for list. Need Vibropack, Heath CB transceiver, 12V. 60W inverter, K2IKZ.

SELL OR TRADE: Factory overhauled Rolliflex Sport Carl Zeiss Tessar 2.8 lens. Want TCS, cash or best offer. Lorenson, Windham, N. Y.

MISCELLANEOUS

Hamfesters Radio Club announces its 26th Annual Picnic on Sunday, August 14, 1960, at Santa Fe Park, near Chicago. See July Announcements column or write K9EEC.

BREAKFAST CLUB HAMFEST July 31, Terry Park, Palmyra, Illinois, Dale Elliott, K9SKJ, Secy. Box 134, Loami, Illinois.

SIXTH ANNUAL Syracuse VHF Roundup, October 8, 1960.

THE ANNUAL PEORIA HAMFEST will be held at Exposition Gardens Youth Building, Sept. 18, 1960. Advance registration $1.00. At the gate $1.50. Contact Larry Pearsall, W9FDY, 2224 Herold, Peoria, Illinois.

VERTICAL DESIGN [*from page 115*]

ing the antenna resistance; if you are using a sensitive bridge in an urban area you may find that the bridge will not read zero when connected to the antenna and ground. There may be enough stray field pickup at all times to give an appreciable reading. A resistance of 2,000 ohms or less, connected from antenna to ground, will usually remedy the trouble and bring the bridge to zero without affecting the accuracy of your measurements by being connected across the bridge.

You can operate a vertical antenna other than as a quarter wave. It may be operated as a half wave against ground PROVIDED you do one of two things. Either provide a feed system or matching device to feed a VOLTAGE POINT (the end of the antenna) or electrically lengthen the antenna by loading so that you provide a total electrical length above ground equal to three quarters of a wavelength so that you have a low impedance feed point at the base which can then be treated as we do a quarter wave antenna. Just one word of caution in operating at frequencies which represent more than a half wave on your vertical; the load may be made purely resistive for one frequency but if you depart appreciably from that frequency the reactance changes so rapidly that a serious mismatch develops. Also note that the desirable characteristic of low angle radiation when used as a quarter or half wave no longer applies when used at higher multiples.

If you are interested only in operating, you can buy someone else's brains and get excellently engineered assemblies with certain specified operational limitations, but if you are interested in learning how an antenna works and how to make it work for you, the foregoing description and hints should smooth your path. No originality is claimed for the basic information in the above, but the summation and presentation is based on long experience. ■

was quite close. The 7 *mc* adjustment should be done next, with the switch in that position. The tap to the variable capacitor ended up 13¼ turns from the bottom, with the capacitor set at about 40% capacity. This adjustment is quite easy to make, and we arrived at exactly 51 + j0 ohms at 7.25 *mc* quickly. The 14 *mc* adjustment, intentionally left until last as it is the most critical, is next made, with the switch in the proper position. This tap ended up at 11½ turns from the bottom, with an input impedance of 41-j3.5 ohms, which is quite close. Here again it was impossible to get an exact 51 + j0 ohm match. The *vswr* measured at the transmitter end of the 60 foot buried RG-8/U feedline is in all cases less than 1.5 to 1, which is quite acceptable.

The adjustments should be rechecked, beginning with that for 3.9 *mc*, to make sure that placement of leads has not changed anything during the tap changing process. It will probably be necessary to touch up each adjustment slightly several times, depending on how critical one is of the results. Also, check again with the cover of the box in place! Distributed capacity may change the settings slightly.

If one does not have an *rf* bridge to do this job, the best suggestion is for use of a grid dip meter and *vswr* meter, with a low powered transmitter to excite the antenna on all bands. An *rf* ammeter can be inserted in series with the lead to the antenna to show antenna current, if desired. The tap adjustments stated above can be used as a beginning, and fine adjustments can be made by the cut-and-try method to get proper loading and lowest possible *vswr* on the input line.

If one wishes, relays may be installed to do the band switching remotely, from the operating position. The control lines should run in direct-burial type of cable, in order to avoid *rf* pickup.

Conclusions

This antenna performs beautifully for DX work, especially on 21 and 14 *mc*, where the radiation is at quite low angles. We can notice a great difference between it and the temporary ½ λ horizontal dipole we used on DX contacts. It reduces stateside interference and brings in the Pacific islands and other faraway places with real sock. Also, it helps reduce TVI because any *vhf* harmonics that may sneak out of the rig after all the filtering are shot up in the air at high radiation angles, instead of being radiated out along the ground where they can get into a neighbor's TV set. The Mark II is about as attractive in appearance as an antenna can be, and will hardly cause a raised eyebrow from the XYL, especially if you put a 3 foot white picket fence around it to keep the children from touching it when it is "hot." If you let her plant roses around the picket fence, she'll be positively delighted. ■

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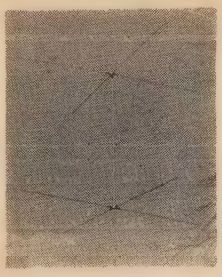

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0A3	.80	6C4	.45	43	.75
0B2	.65	6C5	.69	45	.49
0C3	.70	6C6	1.08	50L6	.69
0D3	.50	6C8	1.08	RK59	1.39
0Z4	.60	*We Trade!*		RK60	1.17
1A7	.90	6CB6	.89	HY69	2.20
1B3	.78	6CD6	1.49	75	.81
1L4	.82	6CF6	.85	HY75	5.00
1R4	.5/$1	6CL6	1.40	83V	.95
We Swap Tubes! What Do/U Have?		6CB6	.89	4PR60A	.37.50
1R5	.78	6CG8	1.12	4-125A	.27.50
1S4	.78	6CM6	.79	4X150G	.15.00
1S5	.68	6CS6	.70	4X250B	.41.00
1T4	.85	6CU6	1.29	4-400A	.41.75
1T5	.95	6D6	.99	4E27A	.39.00
1U4	.6/$1	6E5	.79	250TL	.19.45
1U5	.75	6F4	2.49	307A	.2/$1
1X2	.99	6F5	.79	316A	.5/$1
2C39A	9.00	6F6	.99	VR92	.5/$1
2C40	5.50	*Send 25¢ for Catalog!*			
2C43	6.50	6F7	.99	388A	.3/$1
2C51	2.00	6F8	1.39	350A	2.45
2D21	.65	6H6	.59	350B	1.75
2E22	1.75	6J4	1.72	371B	.95
2E24	1.90	6J5	.59	5146	3.90
2E25	2.50	6J6	.59	416B	.16.00
2E26	2.75	6J7	.99	450TH	.43.00
2E30	1.70	6J8	1.39	450TL	.43.00
2E35	1.60	6K6	.59	460	.11.50
2K25	9.75	6K7	.79	*All Tubes Stocked at Low Prices!*	
2K26	.34.00	6K8	.99	703A	2.00
2K28	.30.00	6L6	1.19	707B	3.50
2V3	.2/$1	6SN7	.72	715C	.10.90
2X2	.48	6T8	.98	717A	.5/$1
3A4	.70	6V6GT	.90	723AB	5.00
3A5	1.00	6X5	.49	725A	2.75
3API	5.95	12AT6	.59	803	3.50
3BP1	3.99	12AT7	.89	804	8.85
3C24	3.50	12AU6	.63	805	6.00
3D23	3.95	12AU7	.69		

We Buy! — *We Sell!* — *We Trade!*

3E29	6.00	12AX7	.79	807	1.10
3Q4	.68	12AY7	1.29	5/$5, 10/$12	
3Q5	.86	12B4	.95		
4-65A	.13.50	12BA6	.65	811	3.45
4-125A	.27.50	12BA7	.99	811A	4.41
4-250A	.34.00	12BD6	.59	812	3.30
4X150A	7.00	12BE6	.59	813	8.00
4X250	.36.00	12BH6	.79	815	1.75
4X500	.37.00	12BH7	.99	826	.59
5AP1	2.95	12BY7	1.00		

Wanted Test Sets and Equipment

5BP1	5.02	12BZ7	.99	828	9.00
5BP4	5.00	12H6	.75	829B	8.00
5CP1	4.99	12J5	.69	832A	6.00
5CP7	9.00	12J7	.69	833A	.36.00
5R4	1.00	12J8	1.35	837	.2/$2
5T4	.90	12K8	.89	866A	2.45
5U4	.99	12SA7	.69	954	.10/$1
5V4	.89	12SC7	.89	955	.3/$1
5Y3	.60	12SF5	.69	957	.3/$1
5Z3	.89	12SG7	.89	958A	.2/$1

Send 25¢ for Catalog!

15GP22	.89.00	12SH7	.89	991	.5/$1
6A7	1.00	12SJ7	.75	1614	2.75
6A8	.99	12SK7	.75	1619	.5/$1
6AB4	.59	12SL7	.79	1620	2.00
6AC7	.72	12SN7	.69	1625	.5/$1
6AG5	.65	12SQ7	.69	1626	.5/$1
6AG7	.75	12SR7	.69	1629	.4/$1
6AK5	.69	15E	1.19	2050	1.25
6AL5	.59	15R	.4/$1	5517	1.25
6AQ5	.66	FG17	3.49	5608	3.95

Top $$$ Paid for 304TL tubes

6AR6	1.95	19T8	1.16	5618	3.25
6AS7	3.49	24G	3.50	5651	1.35
6AT6	.2/$1	25A6	1.19	5654	1.20
6AU6	.79	25A7	2.19	5656	4.25
6B8	1.35	25C5	.81	5663	1.15
6BA6	.59	25L6	.72	5670	.90
6BE6	.59	25T	4.00	5686	1.75
6BG6	1.49	25Z5	.72	5687	1.15
6BH6	.79	25Z6	.75	5691	4.70
6BJ6	.72	26A7	3.99	5725	1.95

Top $$$ Paid for XMTTR Tubes!

6BK7	.99	FG27	8.28	5732	2.00
6BL7	1.35	HV27	.19.39	5736	.85.00
6BN4	.69	28D7	.89	5749	1.95
6BN6	1.08	FG33	.15.00	5750	2.75
6BN7	1.99	EL34	3.49	5751	1.25
6BQ6	1.19	35A5	.69	5814	1.20
6BQ7	.99	35L6	.59	5879	1.20
6BX7	1.11	35T	4.49	5894	.$12.00
6BY5	1.19	35Z5	.89		
6BZ6	.91	RK39	2.99	No See—Write!	

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NOVICE BAND .....$1@
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Include 1st, 2nd, 3rd & 4th choice!
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DC POWER SUPPLIES for TRANSISTORS!

New low-cost filtered 0.5% Ripple Power Supply. Same as specified in Transistor Manual G.E. Ideal for Powering transistor circuits, small in size!

12VDC at 150Ma-
T12V150M .....$ 8
25VDC at 150Ma-
T25V150M $10
40VDC at 1 Amp-
T40V1A $19

NEW POWER CONVERTER
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up to 200MA
100 Watts; Tap at 250VDC
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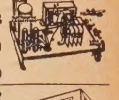

Hi efficiency, low ripple, low idle current-Silicon rectifiers! Toroidal HiEff! Magmetal tape wound transformer, fused & short circuit proof, small in size! Quiet! Light weight! C1250EE built, ready to go. Conservatively Rated. Delco Transistors Heavy Copper-Heatsink.

12VDC to 250VDC up to 150MA
Type C1225A $30

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IRISH/MYLAR Tape 2400 ft.....3/$12
CONDSR Oil/W.E. 2mfd@600WVDC 6/$1
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BANDPASS 60 or 90 or 150 Cys.. each $2
1N34A 45¢@, 15/$5; 1N35 $1; IN38 70¢@;
XTAL OVEN—115V&Thermostat $2
Blower 24VDC/100CFM $3.98
Blower AC/Miniature 6&12VAC $1.00

Xmitting Mica's .006 @ 2500V, 5 for $1.00
Miller 2.5MH/2.5&5Mtr Chokes ...8/$1.00
Vibrators 6 or 12VDC $1.49@; 4/.....$5.00
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New Variacs/or equiv 0-135V/3 Amp $10.65
New Variacs/or equiv 0-132V/1.25A $7.25
RF-MTR GE/475 Ma & 5 Amp $4@, 2/$7
DC-METER Dejur 800 Ma/3½" $3@, 2/$5
DC-METER One Ma/4" Rd. $5@, 2/$8
RF-MTR Weston 750Ma/TC...$4@, 2/$6
DC MTR 100Ma/2½".....$3@, 2/$5

BC696/3 to 4 mc's good condition.....$5.95
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RDZ/USN 200-400 Mcs Rcvrs As Is...$25
G.E./YRS-1 Side Band Selector $45
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4x150 Ceramic/LOKTAL.....2 for $1.00
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"VACDAC"® SILICON TUBE REPLACEMENTS
WITH BUILT IN RF SURGE & SERIES BALANCING PROTECTION

TYPE	VRMS/PIV	AMPS	PRICE
ST866	5000/10400	0.3	$20.00
ST816	5000/7000	0.3	$16.00
ST5R4	1900/2800	0.5	$15.00
ST5U4	1120/1600	0.6	$ 8.00

HDQTRS. TRANSISTORS & ACCESSORIES

2N441/$3; 2N442/$4.50; 2N277/$4; 2N278/$5; 2N155/$1.39; 2N176/$1.80; 2N177/$1; 2N178/$1.75; 2N247/$1.50; 2N255/$1.20; 2N270/.95; 2N274/$1.25; 2N408/.80; 2N554/$1.20; 2N578/$1.80; 2N579/$2.20.
DIAMOND BASED MICA MTG KIT.....30
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"SILTAB" Silicon Rectifier Replacement
Non-Aging Hermetically Sealed
FOR 6 or 12VDC @ 100A, Type YJ9 $24

NEW BATTERY CHARGER ! ! !
FOR 2V OR 4V OR 6V OR 12 VOLT BATTERIES, TRICKLE & FULL CHARGE up to 4 AMP

Charges 2-4-6 & 12 volt batteries.
Built BCK-1 .....$13.50

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Wanted 304TL Tubes & ALL TYPES!!!

*New Silicon *750 Ma Rectifiers, Working Volts RMS-ACV Input!*

rms/piv	rms/piv	rms/piv	rms/piv
35/50	70/100	140/200	210/300
25¢	35¢	45¢	55¢
rms/piv	rms/piv	rms/piv	rms/piv
280/400	350/500	420/600	490/700
65¢	85¢	$1.10	$1.35
rms/piv	rms/piv	rms/piv	rms/piv
560/800	630/900	700/1000	770/1100
$1.50	$1.70	$2.00	$2.50

Use in Bridge or C.T. up to 1 Amp. dc
*Derate 20% for Capacitive input

GENERAL PURPOSE & REPLACEMENT

*Silicon 400PIV. at 250 Ma Rectifiers Hi-Temp 106°C at 252V/RMS. Special 2 for $1; 25 for $10.

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DC AMP	18VAC 14VDC	36VAC 28VDC	72VAC 54VDC	130VAC 100VDC
½	$1.00	$1.90	$3.85	$5.00
1	1.30	2.00	4.90	8.15
2	2.15	3.00	6.25	11.10
3	2.90	4.00	8.60	13.45
6	4.15	8.00	18.75	31.90
10	6.10	12.15	26.30	41.60
12	7.75	14.90	30.95	43.45
20	12.85	24.60		
24	15.00	29.45		

One Year Gtd!

New "TABTRAN" Rectifier Xfmrs

Sec'd Volts (DUAL†) 0-9-15-18-&-0-9-15-18. Series Sec'ds 0-3-6-9-12-15-18-21-24-27-30-33-36 Volts.

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TR4001 @ 1 Amp† ea/sec/winding $5.15
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75Ma 49c, 5 for $2; 100Ma 59c, 6 for $3
150Ma 70c, 8 for $5; 250Ma 79c, 6 for $4
300Ma 88c, 5 for $4; 350Ma $1.00, 8 for $7
400Ma $1.10, 5 for $5; 500Ma $1.35, 5 for $5
This Item P.Pd. 48 states orders $10.

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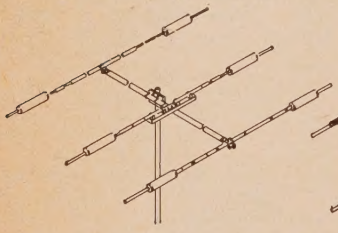

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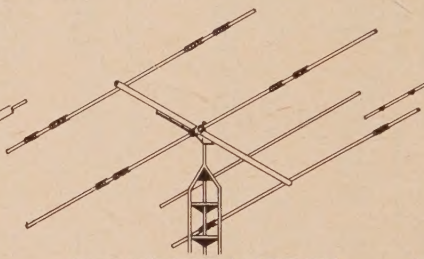
"TRAP-MASTER" ANTENNA
Stock No. 92 CZ 360.....**$97.75**



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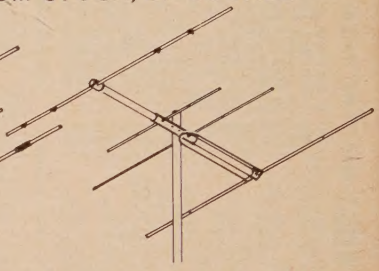
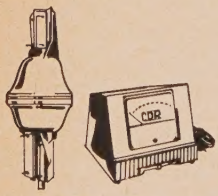
THUNDERBIRD TRIBANDER
Stock No. 77 CZ 361.....**$117.50**



TELREX TC 99 CHALLENGER
"TRI-BAND" ANTENNA
Stock No. 99 CZ 964.....**$159.50**



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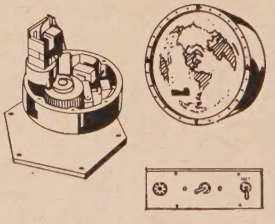
Complete, heavy-duty system.
Stock No. 92 SX 357..**$117.11**



HY-GAIN ROTATOR INDICATOR SYSTEM
RBX-1 "ROTO-BRAKE" (twin-motor unit).
Stock No. 83 SU 691.....**$119.95**

CONTROL SYSTEM—world map indicator and control box.
83 SU 692. Central U.S.A.
83 SU 693. Far East Coast.
83 SU 694. Far West Coast. Each...**$60.00**

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For further information check number 51, on page 126.

NEW FROM NATIONAL

BURTON BROWNE/New York

NC-400

The Most Versatile Communications Receiver Ever Designed

The NC-400 is a modern, multiple purpose, general coverage receiver. Tuning range is 540 kc to 31 mc in 7 bands, with dual conversion on all frequencies above 7 mc. Its unique design provides maximum flexibility of operation to satisfy a wide variety of communications requirements.

The NC-400 may be used as a self-contained unit, either manually tuned or crystal controlled on pre-selected frequencies. In addition, external master oscillator provisions make possible use of modern synthesizer techniques for applications where extreme frequency stability is required. It may be operated in space or frequency diversity applications. Provisions are made for interconnection of any required outputs or for feed to external loads or combiners. All frequency determining circuits may be internally or externally controlled. The NC-400 also provides optimum versatility of bandwidth, either through the use of internal IF circuits or the use of optional mechanical filters.

FREQUENCY RANGE:	GENERAL COVERAGE
Band 1	.54– 1.1 MC
Band 2	1.1 – 2.1 MC
Band 3	2.1 – 4.1 MC
Band 4	4.1 – 7.0 MC
Band 5	6.9 –12.2 MC
Band 6	11.8 –20.4 MC
Band 7	19.6 –31.0 MC

NOTE: Bandspread dial provided with 0-100 logging scale and calibrated for 80, 40, 20, 15 and 10 meter amateur bands.

FREQUENCY STABILITY: Long term stability after warm-up –.002%

SENSITIVITY: 1 microvolt for 10 db signal/noise ratio

SELECTIVITY: 4, 8 and 16 kc positions provided with 6 tuned circuits. 3.5 kc wide upper and lower sideband positions provided with 14 tuned circuits. 3.5 kc sharp position activates plug-in crystal filter providing 5 additional degrees of selectivity below 3 kc plus phasing notch. Plug-in accessory available which will provide front panel selection of three mechanical filters without modification of receiver. Proper choice of filters will enable selection of bandwidths from 500 cycles to 16 kc, or will enable filter type of sideband selection from front panel.

SSB PROVISIONS: Separate SSB heterodyne detector uses pentagrid converter and separate beat oscillator. Beat oscillator may be crystal controlled. Special "fast-attack-slow release" AGC circuit. Sideband selection accomplished by exclusive, new National passband switching techniques. In the event of commercial-type SSB reception, single sideband mechanical filters may be installed and switched from front panel.

FIXED CHANNEL OPERATION: HF oscillator has 5 crystal sockets for use in fixed channel operation. Channels may be selected by front panel switch. In addition, HF oscillator may be controlled from external master oscillator selected by front panel switch. "S" meter "Tune" position permits rapid tuning of receiver to crystal controlled channel.

DIVERSITY PROVISIONS: Basic receiver may be operated from master oscillator as noted above. An accessory Diversity Modification Kit (NC-400 DMK) allows choice of internal or external control of all oscillators. Rear panel selector provisions make possible use of any receiver either as master control, or slave fed from other oscillator sources. IF, detector and AGC outputs available for feed to external loads or combiners.

POWER REQUIREMENTS: 110-220 volts, 50-60 cycles AC

MANUFACTURER'S SUGGESTED LIST PRICE: $895.

OPTIONAL ACCESSORIES:

1. XCU-400 crystal calibrator. Output frequencies of 100 kc. and 1 mc.
2. NTS-2 matching speaker
3. NC-400 DMK diversity modification kit
4. NC-400 FH mechanical filter housing

*Manufacturer's suggested list price. Sold only by National Co. Franchised Distributors

In Canada by Canadian Marconi Inc. 830 [illegible] Ave., Toronto 17

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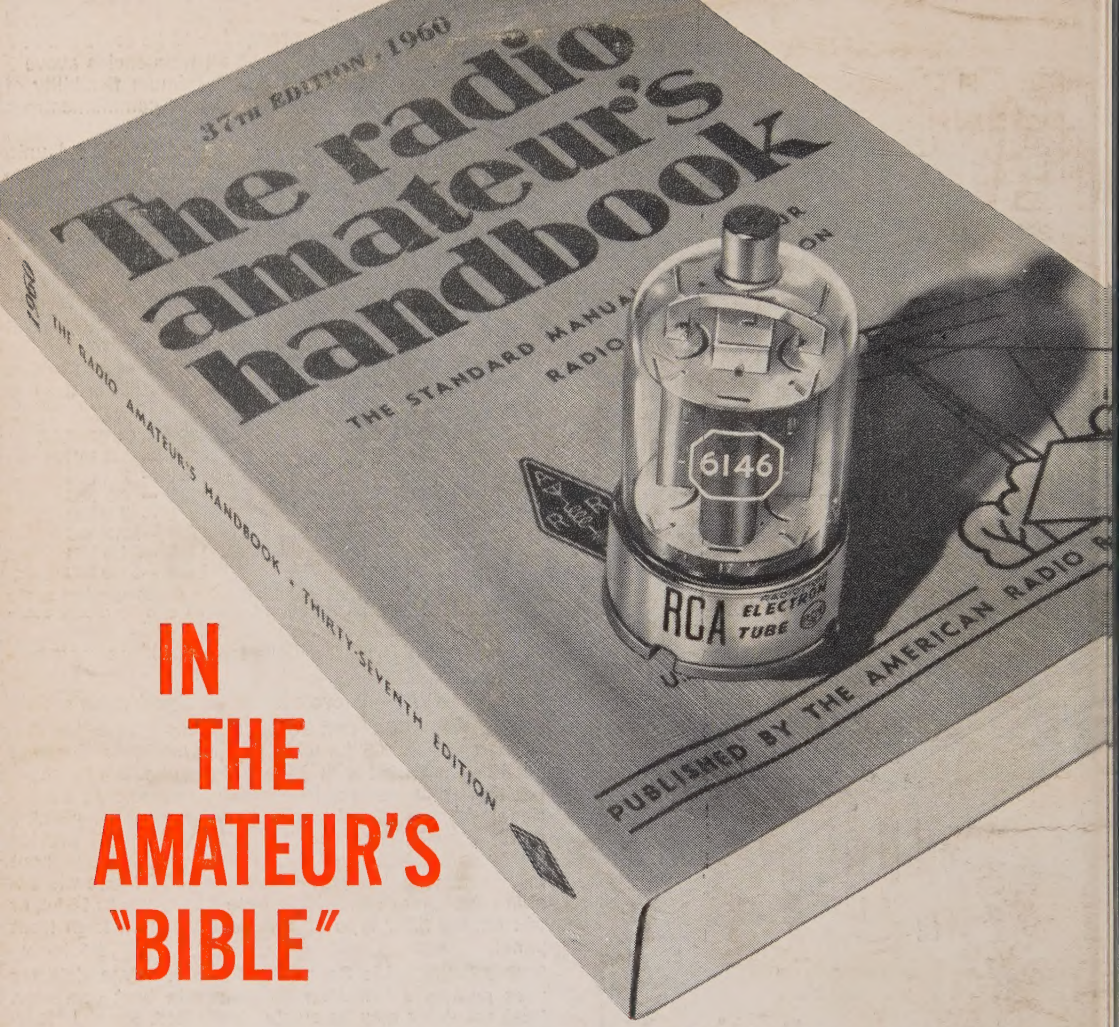

IN THE AMATEUR'S "BIBLE"

...beam power dominates

Over 70% of all the transmitting tube types featured in the HF, VHF, Mobile, and Modulator circuits of the Radio Amateur Handbook are high-perveance beam power types. As the originator of this famous power tube design, RCA is proud to see beam power tubes specified by the Amateur "Fraternity".

Why all this interest in high-perveance beam power tubes?

Take a look at a modern beam power rig. Note the lower-power driver... the minimum number of stages... control simplification... lower plate-voltage ratings... lower voltage-rated (and less expensive) circuit components. Then add it up, and you'll see why RCA Beam Power Tubes are the answer when you're looking for more "transmitter watts" for your dollar.

You can get RCA Beam Power Tubes at RCA Industrial Tube Distributors everywhere. For free technical information on specific RCA Beam Power Tubes listed here, write RCA Commercial Engineering, Section G-15-M Harrison, New Jersey.

Popular RCA Beam Power Tubes for the Amateur
(listed in order of plate input ratings) *

Type	Max. DC Plate Input (watts)	Max. DC Plate volts	Max. Freq. at Max. Ratings Mc.	Max. at Re Rati Mc
5763§ (6417)	17	350	50	17
2E26 (6893)	40	600	125	17
807 (1625)#	75	750	60	12
6524 (6850)	85✦	600	100	47
6146 (6883)	90	750	60	17
829-B†	120✦	750	200	25
7270 (7271)	315	1350	60	17
813	500	2250	30	12
7094	500	1500	60	17
7034/4X105A	500	2000	150	50

* Class C—CW ✦ Twin-unit type, total per
() 12.6-volt or 13.5-volt heater-version
† Tapped heater for either 6.3 or 12.6-volt operatio
§ 6.0-volt heater type # Has different base from typ

RCA Electron Tube Division, Harrison, N. J.

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